NOV 9 1923

VOL. 49 NOVEMBER, 1923 No. 249

United States Naval Institute Proceedings

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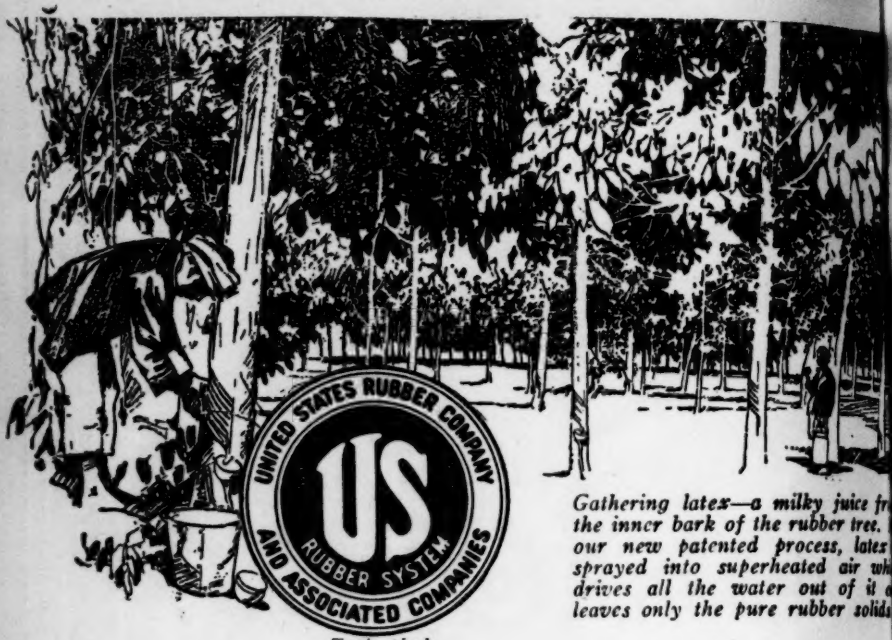

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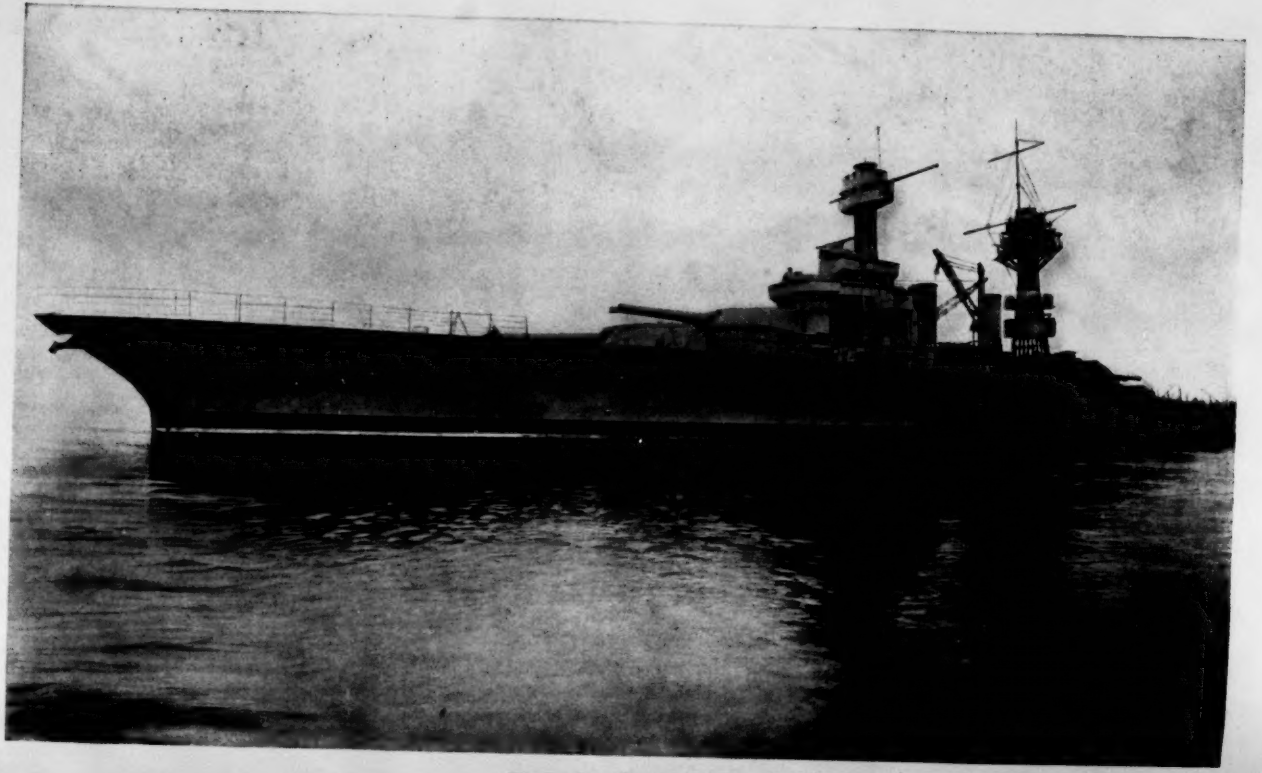

U. S. S. "COLORADO"
Our Latest Dreadnaught

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

VOL. NO. 49, NO. 11 NOVEMBER, 1923 WHOLE NO. 249

U. S. S. "COLORADO"
Our Latest Dreadnaught

EARTH FEATURES AND THE NAVY PILOT

BY LIEUTENANT COMMANDER FITZHUGH GREEN, U. S. NAVY

AN AMAZING fact has just come to light: It appears that not only in the Naval Academy's curriculum, but in maritime literature as well, a most vital aid to navigation has been wholly overlooked.

This aid may be described as: *that class of natural beacons arising from the precise mechanical inter-relation of geological features peculiar to all coastlines.*

Sounds like a pretty ponderous theme, doesn't it? But consider for a moment its genesis.

Last year the writer discovered the following entry in an old diary: "Canadian mariners down the Labrador and Scandinavians cruising toward the White Sea have a peculiar faculty for finding their way in thick weather. Investigation shows that both classes base their ability in this line largely upon a close study of the peculiarities of coastal erosion."

That note recalled to mind a rather tragic conversation in the summer of 1918 with a British submarine commander who had done a great deal of patrol work off the Norwegian, East Danish, and German coasts. He said in substance:

"Few people have any idea what a terrible task navigation is in war time. The usual lights and buoys are nearly all removed or extinguished. Cruising in hostile waters must be done in thick weather or at night if any avoidance of engagement is desired. In our patrol work to the east of England, both in submarines and in destroyers, we suffered a continual agony of doubt about our

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true positions. Many boats were grounded; even wrecked. Frequently our whole work was vitiated by navigational difficulties that beset us. Had I only know then what I know now my digestion might be better and my hair a little thicker."

I asked him what this saving knowledge was. He replied:

"A thorough appreciation of the general topography of the area behind the coast-line one happens to be patrolling. For instance, had I studied the configuration of the delta of the River Ems, off which I spent some awful weeks, I would never have piled up high and dry one afternoon thinking I was on the south side of the river's mouth instead of to the north. Contour of the land was seen distinctly through a light haze. But as there were no visible marks or beacons, and as illustrations in the sailing directions had been posed from a different angle than that from which I looked, I got lost and nearly disembowelled my boat."

Now for a striking confirmation of both the diary and the Briton: There lives in San Francisco, Captain Peder Bane, an old whaler of the North Pacific. He has spent the best part of his life fighting fog and ice and arctic gales from South Japan to Barrow and beyond. Of present moment is the fact that he claims to possess the Indian's instinct for direction and the Eskimo's curious sense of location. Without them, he declares, he many a time would have been wrecked as were his fellow whalers in the fog-drenched area that he cruised.

Coming from a rather well-read man this claim is interesting. Time and again the so-called "instinct" of direction and locality has been proved a lovely myth. That gift is no more than combination of experience with well-developed powers of observation; the two so fully exercised that their use becomes subconscious. That Captain Bane should claim possession of it means simply his long sea service and his ability to keep his eyes profitably open have produced a finished pilot.

But even the pilot must have his guide-posts. Lights and buoys are few and far between on whaling grounds. War navigation, almost, the whalers have. (Recruiters please take note). Peder Bane's secret lies, therefore, in what it is he so successfully has come to know and recognize. Unlike the submarine commander Bane would not admit his human limitations, but stuck to superstition.

"You want a sample of the way I get around in fog?" he asked. I wish I could put it in his own words, sublimely picturesque. "Well, here it is. In the spring of 1908 we went through a bad blow in Japanese waters, just above Tsugaru Strait. We had missed Todohokke and its sulphur smell, which, as you know, goes a good long ways to sea. The fog season was on, and the sea still nasty. In fact it was pretty close to a life and death matter for us to make an anchorage. I knew a little bottle-harbor called Jima and set a course for where I thought it was. Soon we made land-fall of a gray mass dead ahead: surf, and not a

TYPICAL "SAW-TOOTH" SKYLINE ALONG A SEISMOTECTONIC BREAK, INDICATING CLEARLY TO A PILOT THE DIRECTION OF THE MAIN AXIS

sign of the break I knew was Jima. We sure were in a tight hole. Leaking badly. Wind worsening again. And nothing ahead but the dull black loom of land with a crazy skyline that looked just like a saw-blade."

Mark the *saw-tooth* skyline.

"Like a row of saw-teeth, and just as sharp. I had to think quick. A few hours more and we would be done for. We hadn't the slightest idea whether Jima was north or south of us. If we guessed wrong we were lost. There wasn't a safe refuge for fifty miles to either side. I kept looking at that skyline. Suddenly I had the feeling that Jima was to north'rd. It's just like I tell

you: I had a *feeling*. We put her about, and ran for an hour. And we made our snug little harbor neat as a pin!"

Now for the facts: The saw-tooth skyline *south* of Jima is a fact. That there is a saw-tooth skyline *north* of Jima is a fact also. And both are exactly alike—except for one thing: the "teeth" in the northern skyline point south; the teeth in the southern skyline point north. This isn't any sort of miracle. It is simply a case of a "seismic axis" passing through a port normal to its coast-line. On one side of the axis the original earthquake broke ground in one direction; on the other side in the opposite direction. Phenomenon of the skyline was no more abstruse than the splintering of a broken plank. If a man crawled under a bed and then hove upwards till he snapped a slat any boy could tell by examining a section of the wood in what direction the fracture was from the spot at which he looked. So it was with the earthquake shattered skyline out by Jima.

As far as Peder Bane's instinct went he admitted being intimate with the coast. Subconsciously he had long before recorded the compass-like personality of the skyline. Thus, even when he could not see a single familiar rock or cliff, and without a taint of science in his simple nautical mind, he very logically came to a correct conclusion without even being conscious of his reasoning processes.

Here then is the proposition: Accurate piloting in peace time or in war is one of our most difficult and vital tasks. There are circumstances when not only is every artificial beacon missing; but also every sort of mark or listed peculiarity of the coast-line which might throw light on where we are. If, then, we discover a scheme that will add to our store of pilot information a whole new system of coastal guides we may say without exaggeration that the opportunity is a magnificent one.

Geological features of the earth's surface contain just such a store. The notes above illustrate succinctly how such earth features may be used. An outline of the types and methods of classification of all earth features—there are really strangely few—will herein be attempted. And brief as this essay is, compared with the vast bibliography of geological material available, it is quite full enough immensely to enhance the value of our navigational knowledge.

Geology is certainly not the province of the naval officer. He has enough to harry him already without delving into the origin of rocks he spends most of his life in trying to avoid. But geology is the most fascinating of all sciences. And the small dose necessary to illuminate the principles of its application aboard ship will surely not prove offensive.

The age of our globe is always estimated to be past the hoary figure 100,000,000 years. Astral evolution brought the crust on which we live. That this crust is but a form of hardened slag developed from a molten mass has well been proved. Indeed, the heat of the interior is still maintained: rise in temperature being 1 degree F. for each 64 feet beneath the surface. It is the well-supported modern theory that our sun's intensity is similar; and is sustained by contraction like our earth's, which is to say the friction of immeasurable pressure upon the inner mass.

When the earth first began to cool and shrink its change could be compared to that of a punctured balloon. At this stage deflation was so rapid that a constant state of volcanic riot existed. Like the sun it must have given off great heat and light.

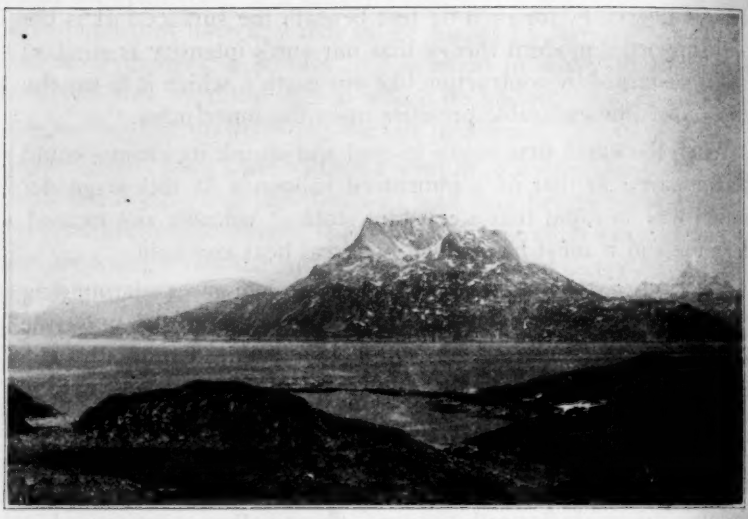
A period of coolness then was reached when gases surrounding the stricken globe could quietly condense. Water fell upon the glowing surface only to sizzle off in steam. Eventually, the water won its right to remain; and so we have our Seven Seas.

The crust was 50 miles or more in thickness. Despite the fact it cooled, great shrinkage still continued. Vast changes came as the centuries fled by. Ocean beds emerged as continents; continents sank again beneath the sea. Great valleys were carved in land by falling water, or walled by fearful mountain uplifts. Rock strata were laid down grain by grain from running rivers, forming what are known as sedimentaries. Sedimentaries by pressure and by heat metamorphosized to solid rock. Here and there great avalanches of molten lava spread upon the helpless land.

Finally, aeons prior to Adam, action simmered down to paralysis and decay. The original fireworks subsided. Only slow erosion and widely scattered outbursts of volcanoes were left. Continents became what we know them as today. And coast-lines grew quite fixed.

These coast-lines still have each their own peculiarities which they inherited from ancient cosmic cyclones: a high bluff here, a black rock there, a conical peak, and so on. We mariners call them landmarks. And we cherish them for the way they guide us home. But such peculiarities are not always easy to recognize even when visible. They are too small, perhaps; and they blend too much into the landscape or become distorted when fog drops down.

In contrast all coast-lines have, however, a special identity springing from their origin. That is to say they are wave-worn



VOLCANIC CONES AS FOUND ALONG PACIFIC AND ASIATIC COASTS, THESE WHEN RECOGNIZED, ARE UNSURPASSED NATURAL BEACONS

or wind-cut, volcanic or iso-static (formed by terrestrial balancing), glaciated or river-graded. Such identity is unmistakable even in low visibility when black rock or conical peak merge deceivingly into the landscape. And the limits of such identity are usually so sharply defined as to fix precisely the particular coastal position to which it belongs.

Whence it is obvious that if the various identities of the world's sea-coasts can be reduced to some simple tabular form the naval pilot can then possess an invaluable background for his sailing directions.

Six major mechanical agents have most to do with the fashioning of coast-line:

Earthquakes and seaquakes.
Rise of molten rock to the earth's surface.
Attack of weather.
Sea waves and tides.
Rise and fall of the land.
Glaciers past and present.

These agents are incessantly at work. Indeed, in all coast-lines there is not a single mile that may not be distinguished by the particular markings upon it of one or more of these great natural artisans. Even the monotonous sandy shores of New Jersey and Delaware, Virginia and the Carolinas, are to the trained eye full of distinctive features. Behind each arid portion there are active such arch-enemies as wind-blown material, weather, and precipitation. Before them grind the equally varied tides and currents of the ocean. And both combine to fix the neighborhood's identity.

Earthquakes and Seaquakes

All coast-lines may be said once to have been volcanic. But of special interest to the navigator are those which recently have been acted upon by subterranean forces.

The appearance of volcanic territory is familar to those who have cruised among the Philippines, or down Alaskan and Japanese coasts. Most noteworthy is its wild and rugged character. Plainly visible are such marks of violence as high and pointed peaks, tumbled rocky shores, and ugly pock-marked hillsides that seem to have writhed in agony before the fires which scorched them cooled. Even after centuries of erosion have smoothed off many of the harshest lines the underlying brokenness is still unhid.

Displacements which cause earthquakes and seaquakes are not intrinsically different from other movements or adjustments of land masses except that they are violent enough to shake surrounding territory.

These displacements become necessary for two main reasons: first, shrinkage of the earth's crust; and second, change in actual mass balance due to enormous quantities of material that are shifted from place to place by action of running water. The

result is that one section of the earth's surface becomes overloaded and sinks. Another section rises. But since the crust attacked by this movement is hard and shell-like, rock fracture almost invariably occurs. Such fracture is called a fault.

Faults are scattered thickly over the whole earth's surface. In Rock Creek or Central Park, or any part of the Puget Sound shore-line, one may see perfect examples of faults. They occur at the bottom of the sea as well as on the surface of the land.

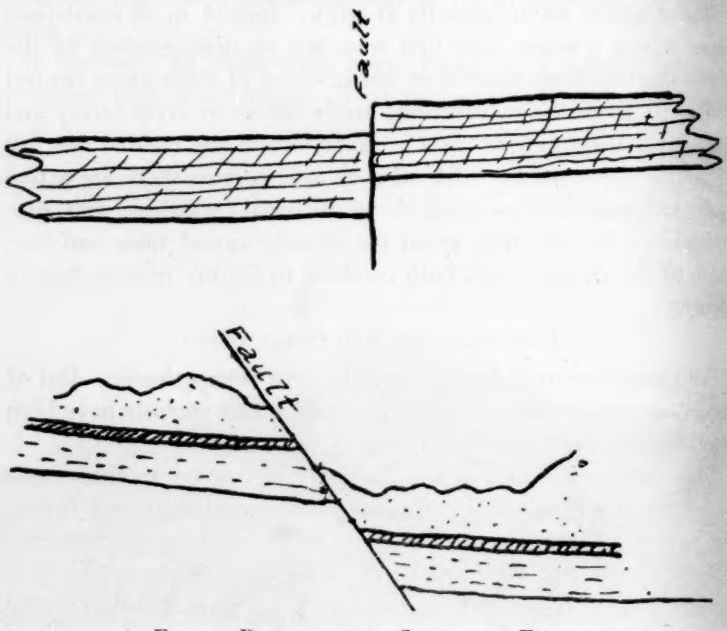


FIG. 1.—DIAGRAMMATIC SKETCH OF FAULT
Above, in level strata; below, in strata previously disturbed

The great Chilean earthquake last year was attributed to such a readjustment of the ocean's bed. Figure 1 illustrates the principle involved.

A fault in the coast is one of the best landmarks in the world. It usually is recognizable in the lowest visibility, and from any bearing. Further, a large fault often runs well inland so that its presence can be detected in the contour of the skyline behind. Large faults in the seacoast north of San Francisco are clearly seen for miles to seaward.

Resulting architecture of a faulted surface depends both upon the pressure applied by earth masses in motion and upon the kind of material that is ruptured. If the pressure be slight the fault lines may be almost geometrically perfect. Be it great and the coast-line will look as if a bomb had exploded underneath it. Some of us no doubt have noticed several such places along the Washington shore-line just south of Cape Flattery. Character of the débris always depends to some extent upon the quality of rock. There are faults in basalt in Connecticut that have formed great blocks as perfect as if moulded.

Since nearly all land bordering on the North Pacific has been subject to earthquake shock it is there we find our best examples of volcanic landmarks. Vertical throw of the land in the great Japanese earthquake in 1891 was 18 feet. In 1899 the Alaskan coast in some sections was lifted bodily upward for a height of 47 feet above its former level. To use such a profound disturbance in the theory herein proposed demands the pilot gain by study or by observation some knowledge of the land itself. For example, in the region directly south of Disenchantment Bay, Alaska, adjustment after the earthquake might be put into three distinct classes:

a. Where the shore was well filled with sand the faulting consequent upon the quake was largely concealed.
b. Where the shore was formed from substantial granitic masses the coast's rise was marked by a very distinct shelf of land high above its former level.
c. Where the shore had formerly been a somewhat disintegrated or previously damaged land mass of varying kinds and qualities the new condition became naturally an area of rocky rubbish.

Thus it will be seen how the pilot thereabouts does not have to depend upon a single item for fixing his position. He does not have to find the "scarred cliff" or the "detached rock" his sailing directions so minutely describe. Instead, simply by recognizing to which of the three classes the shore at which he is looking belongs he knows off which of three approximately ten-mile stretches he is lying.

In this connection the naval pilot should have on his chart-

house shelf the maps that have been made of important earth fractures the world over. These axes are known as "seismotectonic lines." Violent earthquakes in the West Indies have stamped them upon the different groups involved. The same seismotectonic line runs through the neighborhood of Guantanamo and the hills that surround the harbor of Port au Prince.

Width of a seismotectonic line is usually considerable. However, when one is narrow and encounters the coast-line in a limited section it immediately becomes a landmark.

An earthquake does not always break the crust of the earth. Sometimes layers of rock deep beneath the surface are so pinned

A. Stratified Outcrop Weathering More Slowly than Surrounding Rock

B. Volcanic Plug

Both are forms of recognizable natural beacons when the shore-line is difficult to distinguish in low visibility

down by enormous pressures from above that they cannot fracture. Folding of the layers then takes place. Their convolutions eventually become exposed and we see cross-sectional view of the contortions through which the pressed rock went. Layers of this sort were once laid down either by running water, or were lava. In either case the territory they covered was fairly limited in extent.

The so-called "stratified outcrop" thus becomes another means of recognizing coast-line. For while the layers of sedimentary it represents may run for many miles, it is unlikely that its contact with the coast be broad. A few miles at most of any single

formation of this sort is about all that can be expected. An excellent illustration exists at Point Firmin in San Pedro. Rock strata there are well rolled and of limited extent. To be sure the Point itself is a splendid landmark. But in thick weather it is conceivable that some patrolling vessel might enter the coastal depression to the northwest and locate herself by recognizing the strata that mark the lighted headland. Once this feature were discerned the boat's location would be accurately determined within a mile. And, what is more important, the fact that she was to northwards of the Base would be absolutely settled.

It must not be forgotten that most earth features are obscured by soil. Yet soil on the surface of the earth is nothing more than a film. Vegetation tends to increase it and to hold it in place. But as a factor in the recognition of geologic coast-marks it is largely negligible except insofar as making due allowance for its presence.

Rise of Molten Rock

Sometimes earth faulting is so violent that friction melts the rocky sub-structure. Molten rock is then ejected in the form of lava.

It is a matter of common belief that volcanoes are mountains in the sense of being up-thrust portions of the earth. This is not so: and therein lies a point of solid value to the mariner. Volcanoes are simply piles of cinders or lava which originally poured from a vent in the level surface of the earth. Kind and amount of ejected material determines configuration and size of the volcano. Most of us have seen superb Mount Rainier rising out of the almost level plain on which it stands. It is simply a pile of terrestrial rubbish that was once disgorged from the belly of our globe when a convenient crack appeared.

Nor is there true combustion in volcanic eruption. The cloud over Vesuvius is not smoke, but steam. The "Valley of a Thousand Smokes" in Kodiak Island is really a valley of a thousand steams. Some of the greatest eruptions that have ever occurred have poured out only great flat plains of lava. Such lava spreads are visible in several places from the window of a trans-continental train in eastern California.

There are three main types of volcanoes, depending on the

kind of ejected material: the cinder cone; the lava dome; and the composite type in which both occur. See Figure 2.

It may seem aside the subject to go into such detail. But here again we find valuable material that certainly should be recorded in coastal pilots, if not in the navigator's notebook as well.

For instance the fleet is piloted to some extent each year by examples of each kind of volcano. Our friend San Pedro Hill may be taken as a simple lava dome. Those pointed peaks behind Cape Maysi, Cuba, are cinder cones. Santiago Mountain near San Diego is of the composite type, formed both of lava and of cinders.

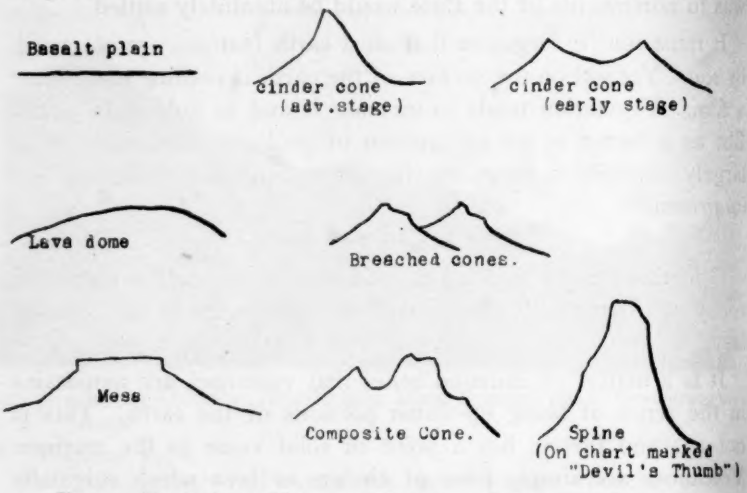
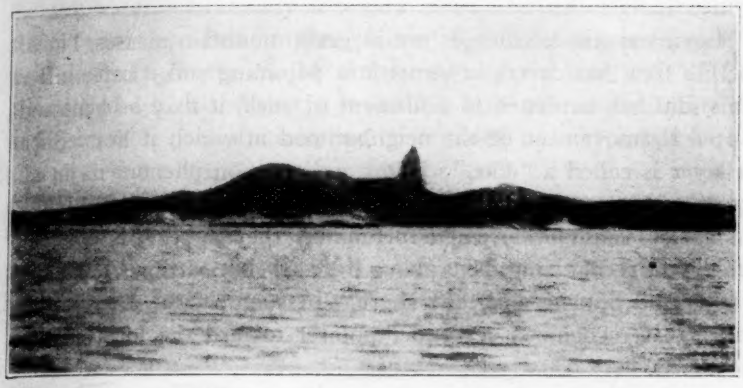


FIG. 2.—PROFILES OF VOLCANIC FORMS AS SEEN FROM SEAWARD

A fourth example has already been mentioned: Mount Rainier. This extinct volcano is interesting because it really forms a fourth class, not geologically, but for the naval pilot: it is one of the "breached cone" kind which has blown its crater out with such force that distinct truncation at the summit identifies it. This feature will often distinguish a volcanic peak at a long distance and from any angle when the photographs extant are hopeless guides.

How much navigating and piloting may be done with the aid of volcanoes may be judged from the fact that they dot both Asiatic and Pacific coast-lines. Astronomical position of many has been charted with great exactness. Last year during gunnery



VOLCANIC SPINE ON CAPE WILCOX

exercises out West the fog used to lie upon the surface of the water to a depth that left the jagged summit of Catalina Island just exposed. Even then the haze made it difficult to tell one peak from another. If, however, a navigator had taken the trouble to note volcanic peculiarities of the island he would have discovered near its center a distinctly beautiful example of "breached cone." This cone looked generally like all the others. But from a geological standpoint its identity was fixed so sharply that it was unmistakeable even when the island was almost wholly out of sight in fog. West Coast navigators please note.

MOUNT RAINIER: THE CLASSIC TYPE VOLCANO OF AMERICA

Lava sometimes emerges not in great mountain masses, but in a thin film that covers or penetrates adjoining soil. Later, after this film has hardened to a filament of rock, it may be bent and lifted by movement of the neighborhood in which it lies. Such a layer is called a "dike." Dikes are common phenomena in all parts of the country and need no further explanation. Their use as coastal landmarks, when fortunately they appear, is confined chiefly to recognizing them above the mist that ofttimes hides our lights and beacons near the shore. In such a case the dike becomes, if recognized, a slender pointer toward the location that it marks.

Attack of Weather

Weather is the most insidious enemy any land mass faces. In course of centuries there is always risk that some subterranean dynamite may explode. But that chance is trifling as compared with endless gnawing of the rain and snow, heat and cold, wind and the rasping sand it carries.

There are two kinds of erosion due to weather; and the effect of each is so definite that here again we find a well-marked trail for the wary pilot to follow. They are *Disintegration* and *Decomposition.*

Disintegration is purely mechanical action. No coast-line is completely free from it. It is the bodily breaking down of the earth's outer shell by frost, heat, water, ice and wind-borne sand. At the cliff's foot there is always a mass of broken rock. This mass has been flaked off by unequal expansion and contraction of the cliff face due to heat of the day and coolness of the night. Flowing water cuts and notches shore-lines, and rounds off contours of the hills. Frozen water—glaciers—sculptures deep ravines and fiords in the hardest granite. Wind-blown sand carves solid rock away. Waves and tides undermine the prominent headline, or carry sand and silt from the low foreshore. All are items of vital interest to the navy pilot.

Decomposition is the term given to chemical degeneration. In the atmosphere are found such corrosive agents as oxygen and carbon dioxide, forming carbonic acid gas. In the presence of water these agents react chemically with minerals of various sorts and form other minerals, carbonates and hydrates. Rock thus

attacked is in the position of a ship's bottom corroded by action of the sea water. Gradually it wears away and its original constituents are deposited in other places. Kind and degree of such wear depend upon the climate and on the material attacked. The presence of a highland that is essentially limestone and subjected to considerable precipitation may be revealed in low visibility by a nearby shore-line distinctly white or gray. There are spots along the Potomac where river pilots find their way in fog, not by configuration of the low shore, but rather by the materials composing it. There are beaches in Southern Brittany where the sand is black with ferric powder washed from hills behind.

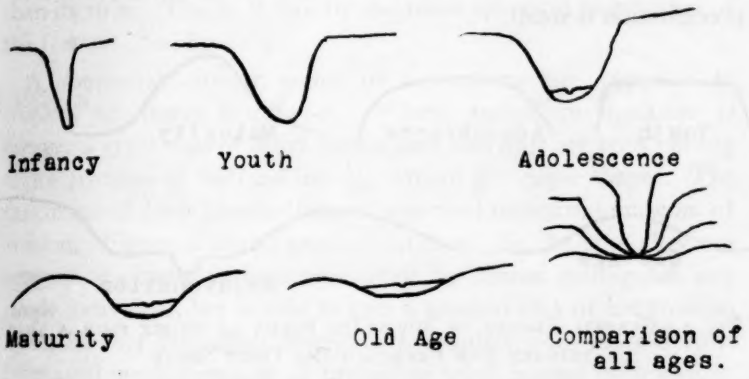


FIG. 3.—SKYLINE FORMS OF EROSION BY RUNNING WATER AS VISIBLE ALONG THE COAST

Often a section of a coast is designated on the chart by a river mouth. Approaching from seaward the pilot finds himself facing half a dozen depressions or valleys against the skyline, any one of which may contain the river sought. He dares not get close enough to see the water flowing. How then may he detect which valley is the one? Key to his problem shows in Figure 3. This series of sketches demonstrates the difference between narrow gullies cut by mountain torrents and the broader features of a full-fledged river. In this connection the U-shape of a glacial gorge must be noted as contrasted with the V-shaped water-cut ravine.

A similar cycle can be drawn to show the progress of erosion on

mountain forms; see figure 4. Southern seaboard of the United States may be taken as example of landscape very old. Its contours are low and rounded. In contrast the ragged skyline of the Olympian Peninsula below the entrance to Puget Sound is relatively youthful. Such broad distinction may not be much help to navigators along a continental border. But one can profitably apply the principle to nearly any island. The new-born islet is sharp and well-defined in angularities. A middle-aged projection from the ocean's bed grows smooth and rounded. This rounding is accentuated by aridity of climate. Witness the coast of southern California where weathering from gouging waters of precipitation is small.

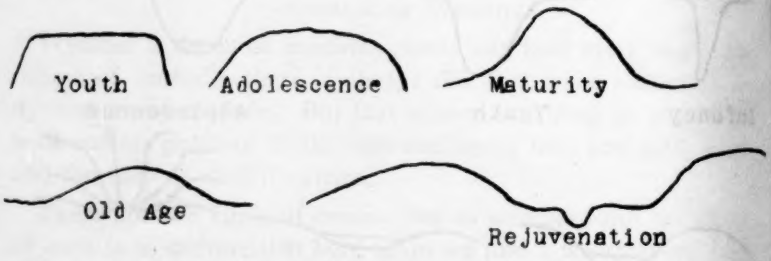


FIG. 4.—GENERAL EROSION OF MOUNTAIN FORMS AS VISIBLE FROM A SHIP BETWEEN SAN FRANCISCO AND PUGET SOUND

Disintegration due to sharp exchange of heat and cold is one of the most effective architects of natural beacons. Principle of this action is that rock is poor conductor; only a thin skin heats in sunlight hours. In consequence this skin expands, then shrinks from day to day. In time it peels off exactly like the sere flakes of an onion. Thickness of the layers thus lost is measured by the kind of material and intensity of the sun. The southern side of rock or cliff is more affected than the northern.

An excellent illustration of this form of erosion and one much used by coastal pilots may be found near Cape Mendocino. Here are two amazingly similar rocks of nearly equal size and same configuration. In low visibility it is impossible to distinguish the pair apart so far as sailing pilot goes. Yet to confuse them would falsify the ship's position by several miles. One versed in the elementaries of geology would, however, immediately note that

FIG. 5.—ROCKS IN SEA ON PACIFIC COAST EASILY MISTAKEN WITHOUT GEOLOGICAL DATA

the "Sugar Loaf" is of harder and of certainly different material than its twin. This is shown by the more spherical exfoliation of the former. See figure 5.

A somewhat similar series of formations are common to tropical or desert landscapes. Where annual precipitation is meager a great deal of wind-blown sand and dust are busy cutting major features of the land into all sorts of grotesque shapes. The ranchman of New Mexico lives in a perfect terrestrial museum of erosion. Figure 6 shows general outlines. To the pilot they are interesting chiefly in instances when he cannot distinguish any single individual, but is able to gain a general idea of his position from the fact prevailing winds mark weather sides more deeply. In coastal work direction of prevailing wind is vital information.

Sometimes such forms reduplicate remarkably. This phenomenon is due to the weathering agent's having taken advantage of the rock's joint structure. When such joint structure, which has its basis in the underlying crystallization, is rectangular we

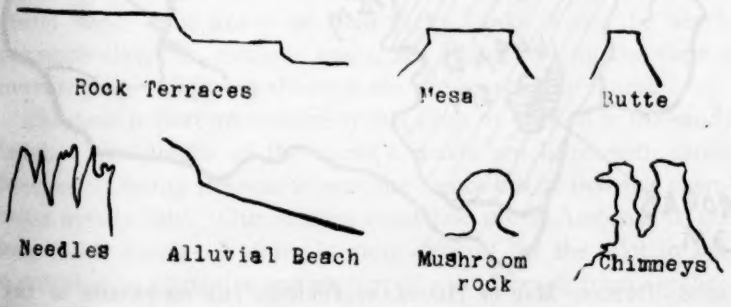


FIG. 6.—CONTOURS OF EARTH FEATURES THAT ARE SEEN ALONG AN ARID COAST: FORMED MOSTLY BY WIND-BLOWN SAND

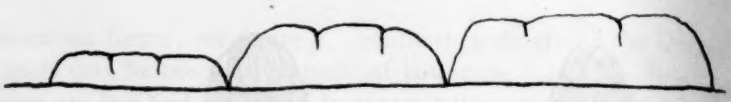


FIG. 7.—COASTAL REDUPLICATION AS SEEN IN SOUTHERN CALIFORNIA AND OFF NORWAY

have a beacon typified in coastal sections of lower California. See figure 7. Such series make an excellent landmark when coast-line contour is much too regular for recognition by any other means.

Should not the young watch officer make mental note in passing?

SEA WAVES AND TIDES

The sea itself is another unremitting parasite upon the land. Curiously enough those people used to living both by and on the water are most given to underestimating the action of the surf and tides. A single classic case of wave-erosion will suffice. Outline of notorious Helgoland is given in figure 8 showing depreda-

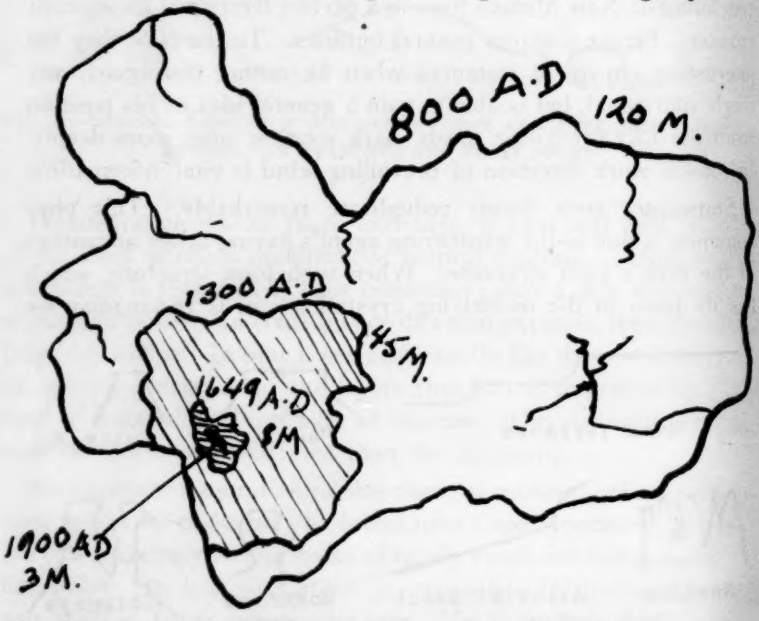


FIG. 8.—OUTLINE MAP OF HELGOLAND SHOWING THE PERIPHERIES OF THE ISLAND AT DIFFERENT STAGES IN ITS HISTORY

tions of the sea upon it. The Germans made frenzied but fruitless efforts to save their nubble from devouring ocean currents.

The navy man should never cease to observe this particular form of erosion be he navigator or not. Silhouettes of capes and headlands are his daily diet. And scarcely one exists that is not eloquent of the particular manner in which the land succumbs to onslaughts of the sea. Pacific coast-line of our country is in this wise most vividly portrayed. There we have those beautiful arched rocks along the Oregon shores; bold terraced slopes just south; and sloping cliffs past them. Even in a long parade of almost identical headlands one may be picked from another simply by the angle at which its bluff-face lies. This angle is the "angle of

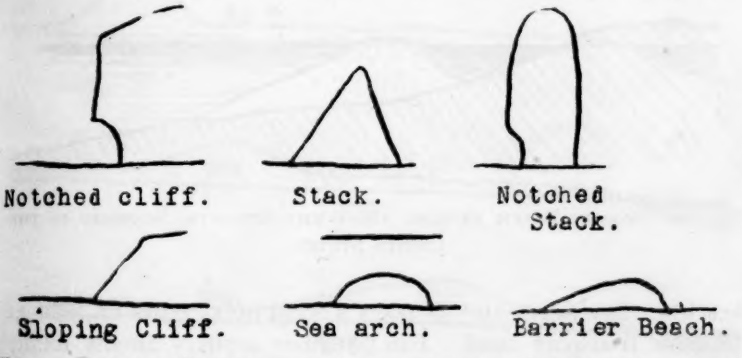


FIG. 9.—TYPES OF PROFILES THAT ARE VISIBLE ALONG A ROCKY SHORE-LINE WHEN PASSED FROM SEAWARD

repose" for material therein collected. For light deposits it is a gentle slope. For heavy or solid rocky banks it may be nearly perpendicular. In extreme cases, see Point Firmin, the face is overhanging. Figure 9 shows some of the profiles found.

The most important feature in this class of erosion is the sandy beach. Nine-tenths of the world's coasts are lined with sandy beaches. During the war it was the sandy beach that the patrol boats mostly saw. Our eastern coast-line up to Ambrose is one long sandy beach. Nothing is more difficult for the pilot to seawards than to recognize one portion of a sand-beach from another. Yet no type of coast-line has received so little intelligent notice in our Sailing Directions; or so little study by those who best could teach us in this illusive form of land-fall.

Let us briefly review formation of the sand. Mother rock is split by frost and heat. Rain dissolves out binding minerals. Insoluble grains like quartz are carried to the sea. Tides shift the river's cargo up and down the coast. Waves distribute what the tides have left. Ebb comes: the sand is bared, then dried by sun till light grains drift like snow. Hence the lowly sand dune.

Formation of our sand-hills is also well worth observation. It has been discovered that the ratio of length to height is exactly the same in all wave phenomena: that is, from crest to crest is always seven times the depth from crest to trough. This applies not only to undulations of the sea, but to ripple marks in sandstone; and to sand hills on the beach. Atlantic seaboard sand hills to which we are accustomed are usually superposed upon their barrier

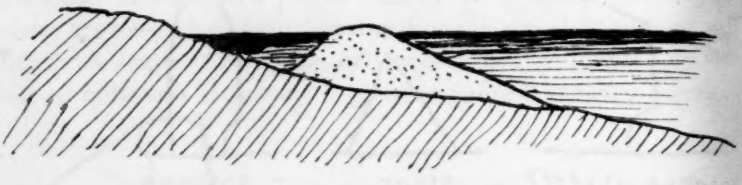


FIG. 10.—BARRIER BEACH AS SEEN ALONG THE ATLANTIC SEABOARD OF THE UNITED STATES

beaches. See figure 10. It takes a wind of 15 miles an hour at least to transport sand. Fair weather zephyrs almost totally ignore the dunes. But as soon as seasonal storms commence the dunes begin to build and travel. The dune's high side is always leeward. Here again the pilot should be well-informed on which way shore winds blow.

I remember one spring fishing off the Capes. We were anxious to find the mouth of a little river which we proposed to enter. Hailing a small schooner for information there came reply: " 'Deed, suh, I think it's there," in dialect unmistakable.

"But how do you know it is?" we persisted.

To which the sailorman replied that if we studied the shoreline carefully we should see an almost invisible rise at one point, just a slight irregularity in the sand-beach contour. But once seen, this small rise sheered up so sharply compared with other curving dunes that it would be ever afterward unmistakable.

Explanation from a geological point of view was simple: The river we wanted brought down sand and mud, building itself a bar. At low tide this bar uncovered in a broad bed of sand for the southerly storms to seize and take along. In consequence the dunes just northward were definitely larger.

Think of the value of such reasoning to the war patrol, or the peace-time runner of rum!

On the other hand must be noted the peril in ever taking bearings on a sand-hill, no matter what its size. There is official

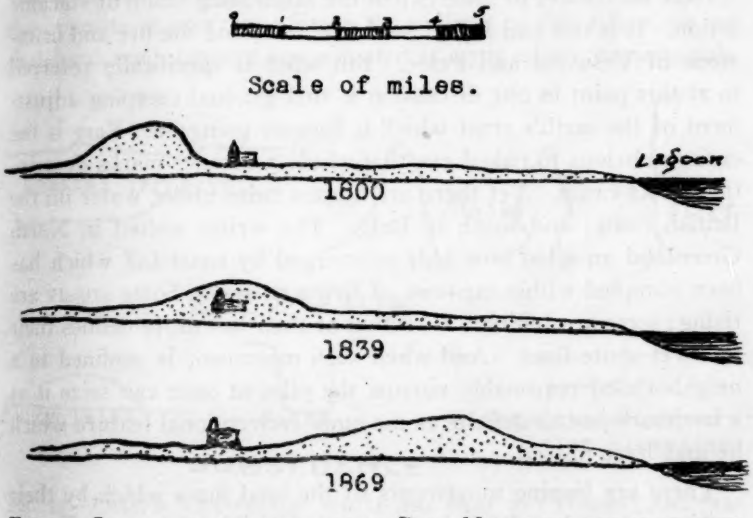


FIG. 11.—SUCCESSIVE DIAGRAMS TO SHOW DUNE MOVEMENT; BURIAL OF TOWN OF KUNZEN BY SAND MIGRATION IS INDICATED WITH DATES
(After Behrendt)

record of a large and charted hill near Liverpool being moved a total distance of 200 yards in the space of a single gale. One stormy month can change the entire configuration of a beach. See Figure 11.

Total coastal erosion falling annually into this class is enormous. A naval officer can see in his career the physiognomy of a well-known beach change markedly with material dragged to and from it by the sea. Thus old inhabitants around Hampton Roads speak feelingly on the movements of their beaches.

Great Britain's Ordnance Survey makes periodical investiga-

tion of erosional loss and gain. A recent report shows that to the island which is England there was added in one brief year a total of 48,000 acres. Anyone who has passed over the Potato Patch at the entrance of San Francisco Bay must have wondered at the amount of material dropped there by the tides. It is on this curve that the out-sweeping current slows up sufficiently to precipitate its burden gathered from the good land eastward.

Rise and Fall of Land

Here we reenter to some extent the fascinating realm of volcanic action. It is rise and fall of land that is behind the fire and brimstone of Vesuvius and Pelee. But what is specifically referred to at this point in our discussion is that gradual creeping adjustment of the earth's crust which is forever going on. Rare is the case so obvious to naked eye that whole assurance marks description of its cause. Yet there are human ruins under water on the British coast; and south in Italy. The writer visited in North Greenland an igloo now half submerged by coast-fall which has been occupied within memory of living natives. Some coasts are rising; some are falling. Direction of their last move defines their tide-wet shore-lines. And when such movement is confined to a neighborhood reasonably narrow the pilot at once can seize it as a landmark just as definite as the more conventional feature which he may have missed.

There are leaping movements of the land mass which by their suddenness and violence have mangled visibly the part affected. Thus up-thrust Alaska coasts were tumbled about and scarred with ruthless force. Most of us are familiar with the Camiguin peak just north of Mindanao. In 1871 this spot was level plain. A fissure opened unexpectedly near the town of Catarman, and the earth spewed out an ugly mass to tower 2,000 feet into the sky. In contrast thereabouts some sadly-fated islands have disappeared over-night into the abyss of the sea.

But additionally there is a class of coastal movement so gentle that the line of rupture may be quite invisible. Or there may be no line at all. The latter faultless action is exemplified along the Greenland coast where its ice-cap is here and there retreating. Released from the enormous weight that burdened it for centuries

the land so freed works slowly upward until whole acres of ocean's bottom are exposed. Such originally occurred in British Columbia, which once was buried under ice like Greenland. But a secondary movement took place later; and the coast which rose so gaily found it could not retain its new-found eminence. Unhappily it sank back. Islets dotting Esquimault Harbor near Vancouver and many parts of Puget Sound are but summits of submerged land masses. Photograph of Eagle Island in Casco Bay shows the opposite in progress. From the outlines of this island we see that local readjustment has elevated it again after previous sub-

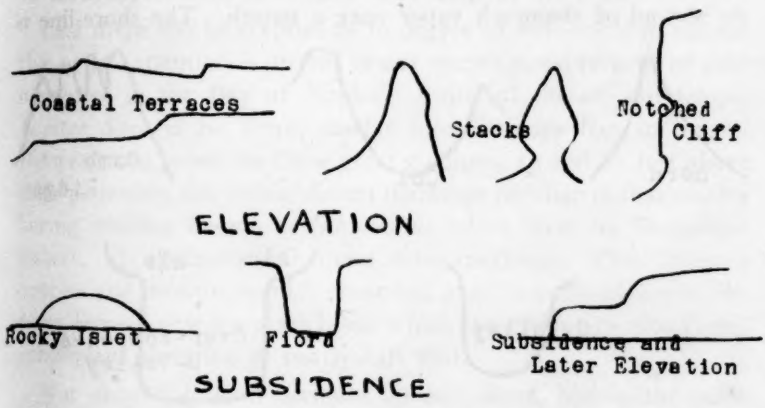


FIG. 12.—COASTAL CONTOURS BY WHICH THE PILOT MAY CLASSIFY THE PARTICULAR LAND HE IS PASSING. ALL TAKEN FROM ACTUAL SKETCHES OF FEATURES ON PACIFIC COAST OF THE UNITED STATES

mergence. Its rounded contour is characteristic of an ice-worn seascape. The fringe of low foreshore marks level of the sea before the present lift began.

When the coast-lines rise or fall the sea engraves a record thereupon. Figure 12 illustrates the principle involved. Sea shells are found far inland. On a bluff near the Naval Proving Ground lies a deposit of them a hundred feet above the river. Last year at our California base a half-buried whale skeleton was discovered 2,000 feet above the present beach. The writer made a special trip to verify the find. Whales and molluscs are not much in the way of mountaineers. If they are going to rise in the world the land has to provide the elevator.

Coasts that are emerging are always scalloped with old sea beaches. Study of these beaches will provide the navy pilot with future guide-posts for his work. He will observe that a beach-line hundreds of feet above the tide is distinguishable for miles to seaward. As many as a dozen headlands may be notched thereby. But more often coastal rise and fall is so uneven that a single upraised beach is but a short dimension in extent.

Thus comes another aid to navigation. For once the pilot recognizes the individuality of a particular beach he will know it from one end to the other.

There is a stretch of south Irish coast that does not emerge from its shroud of shamrock vapor once a month. The shore-line is

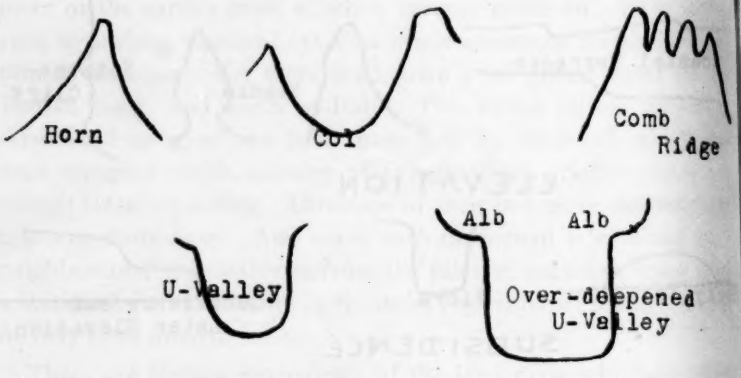


FIG. 13.—COASTAL PROFILES PECULIAR TO HIGH LATITUDES WHERE ICE-SCULPTURING HAS DETERMINED MOST EARTH FEATURES. EXAMPLES FROM ALASKAN COAST

monotonous and contains not a single noteworthy feature in the way of prominent rocks or trees or houses. Yet really there exists upon this stretch a landmark over a mile in length, and one so inescapably definite and peculiar that it could not be mistaken anywhere in the world. It consists of an old beach-line well above the sea. The ocean carved it centuries ago with peculiar knife-like sharpness. Along it runs a line of sea-worn shale which prevents effectually the growth of vegetation. In consequence not only is it conspicuous on the nearby headland where its contour shows against the sky, but along the hillsides where the vivid scar it makes is visible in sharp delineation. The fact that oscillations of

the shore-line subsequent to its formation confined this terrace to a very limited neighborhood augments tremendously its value as a beacon.

Should not the navy pilot know a thing like this?

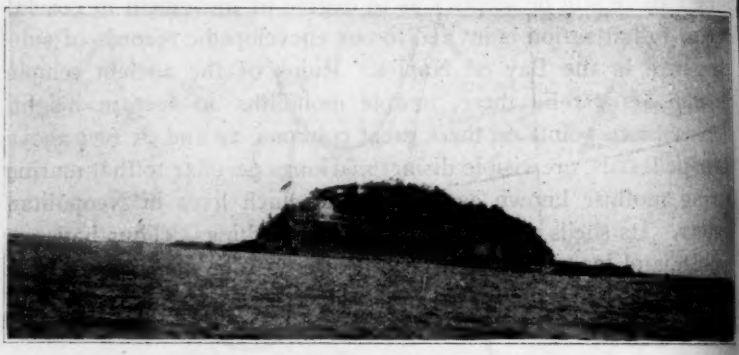
Scarcely a foot of coast-line of the United States exists but is marked in similar fashion. Either the land has largely risen, as along some California portions; or has sunken, such as further north on glaciated margins of the pine-wood country. In the former precincts run long clean lines of ancient beaches one above the other, far up among the highlands of the capes. In the latter forest troops stand sometimes knee deep in the ocean.

Lest there still be sceptics as to degree of movement in coastal rise or fall attention is invited to our encyclopedic records of submergence in the Bay of Naples. Ruins of the ancient temple *Jupiter Serapis* lie there, marble monoliths 40 feet in height. Between two points on these great columns, 12 and 21 feet above their pedestals, are visible disinct markings peculiar to that marine boring mollusc known as *lithodomus* which lives in Neopolitan waters. Its shells are still found in the markings. Thus have we concise and incontrovertible record of a 40-foot subsidence of the *terra firma*—save the mark!—on which these columns stood; and subsequent elevation of nearly half that.

Not only does land oscillate up and down, but in the same neighborhood two directions of movement can often be observed in close association. This fact is what so narrowed the feature described above as peculiar to a portion of the Irish coast. Closer home is the singular disparity of conditions between San Pedro and its outlying islands, Catalina and Clemente. The coast in Santa Barbara Channel, including San Pedro and Clemente, has in late years been rising rapidly. Beaches far above the level of the water define San Pedro hill's emergence at 1,240 feet; the island San Clemente at 1,500 feet. The latter also carries in its shallow, wide-spaced gullies the characteristic contours of adolescent weathering. Amazing to state, in contrast, Catalina only a few miles north has been sinking. There no beach lines are visible above the level of the sea. And those of us who have spent our time in waters just below it will remember that the bold south end emerges precipitately from the ocean, not even the forefoot of or-

dinary weathering being visible: unmistakable evidence of its downward movement.

Could anything better emphasize the value of earth features to the pilot? Imagine an enemy submarine picking furtively its mist-bound way toward the harbor of Los Angeles. Loom of land appears ahead. Soundings and dead reckoning limit the find to one of two like islands: Catalina or Clemente. But which? Time presses. A mistake and the quarry is lost; perhaps the enemy himself. He must choose, and swiftly choose at that. No landmarks, beacons, lights, or satisfactory soundings to guide him.



ROCKY ISLET IN CASCO BAY, MAINE: LOW BEACH INDICATING ELEVATION AFTER FIRST SUBMERGENCE

Just that vague configuration against the gray fog-bank ahead. . . . But how simple for the navigator who can turn to data that informs him, "Island one is going up; island two is going down." Even in the murk the scalloped skyline of emergence is now clear: It must be San Clemente!

Should not the navy pilot know of this?

As a matter of theory it has been asserted that apparent rise of many coasts is due to the depression of nearby ocean beds. Sea-level in the vicinity is thereby lowered, with consequent emergence of the shore.

Character profiles of moving coast-line are given in figure 12. The naval voyager will do well to fit them to the headlands that he passes in the future. The habit is a good one to form.

Glaciation

We come now to the mightiest sculptor of all nature: Ice.

Several ice ages have left indelible records in rocks and coastlines of the world. The last of these engulfed the northern half of the United States less than 12,000 years ago. As far south as New Jersey, and clear across the continent, we find the scourings and the rubbish that great ice-drift left before it perished.

The reader will perhaps protest against a topic so redolent of blubber, cold, and dark. But it may be illuminating to record

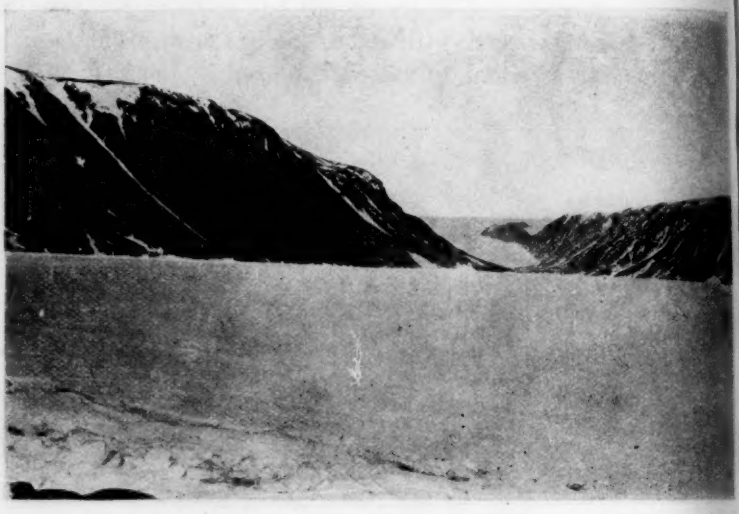
Glaciated Landscape: Ice-scoured contours are unmistakable over four-fifths of the coastline the navy navigator sees

that the very spot on which this essay is being written, Newport, is notable as providing one of the finest examples of a glacier's work extant.

There is an eminence known as Iron Hill about fifteen miles above Providence, R. I., composed largely of black magnetite rock. It is the only one of its exact kind in this neighborhood. From Iron Hill has been distributed by ice a broad path of fragments down the shores and bed of Narragansett Bay. With these fragments run the gougings and engravings on all hard rock surfaces that bespeak the glacial vehicle of long ago. Hence the contours hereabouts.

Another class of conspicuous relics left by glaciers are "erratics," or large boulders, which were transported for unbelievable distances in the body of the ice. In Bronx Park, New York, there is an enormous erratic resting where the glacier left it on a support of quite a different kind of rock.

To the pilot all conspicuous rock formations are useful landmarks on a coast. One who has had experience will recall the difficulty of remembering characteristics of each particular beacon



FOULKE FIORD

One sight of a real glacier will clear up the origin of most earth features along Puget Sound, Alaskan, and many South American coasts

of this sort. But in glaciated country both size and shapes of rocks may far more readily be memorized simply by remarking positions in which the ice-sheet long ago has left them. Further, since glaciers are by no means always tremendously broad, a narrow lane of glacial débris when recognizable is just as good a landmark as any single feature.

The mariner who has cruised in arctic waters is fortunate for having seen the glacier's work in all its newness, and before the smoothing hand of weather has taken its sharpness away.

Let there be no mistake about the activity of an ice-sheet. While

most of them are now in a state of safe and sane quiescence it is by no means uncommon for a movement of many yards a year to be observed. The great glacier in the Isfiord, Jacobshavn, South Greenland, bounds along at several feet an hour. Thunder of its calving bergs is deafening. The imagination is taxed to reckon the damage done to helpless land beneath.

In Alaska and on Scandinavian coasts we see fiords freshly cut. Their typical U-shaped outlines distinguish them from V's that rivers carve. In areas further north, where the ice sheet is still perennial, glacial tongues project at almost normal from the body sheet. For this reason there may be stated the general principle that the axis of a glacial cut is usually rectilinear, and turns only in large and sharply-bordered angles. Thus we have the deep-cut inlets of the bays on either side of Newport running nearly parallel, and perpendicular to what we know was the body of the original sheet of ice. Likewise run the gorges by Manhattan Island, the North and the East Rivers. A similar tracing might be made among the coast-lines further north; but much submergence in the distant past has obscured the salient items we might use.

In discussion of volcanic mountains it was pointed out that the navigator's best aid to recognition of a lava peak was its geological character. In like manner it is worth listing those lineaments that symbolize the ancient glacier's action.

The last remnants of glaciers are naturally found in high altitudes. On Mount Rainier the Sisqually glacier will dwindle gradually with any decrease of length of winter cold. As it shrinks it will leave along adjoining mountainous walls a series of indentations titled "cirques." A cirque or glacial bowl may be several miles across, depending on the size of ice deposit from which it came. Further action on the mountain will result from the Sisqually sheet meeting another on the northern side. The mountain summit may then be split in "horns"; the saddle between each horn is termed a "col." The Matterhorn in Switzerland is our classic example. Another feature is the "comb ridge," which is identified by name. Sometimes the U-shaped valley of a fiord is far below the level of the original breadth of ice. The latter leaves its

mark in gentler slope before the steeper drop. This slope is called an "alb."

Figure 13 illustrates the various contours. The navy pilot sees them all. Indeed, rarely a vessel takes the traverse from San Francisco northwards but that her navigator makes brief, pathetic efforts to distinguish snow-clad peaks by names he sees collected on his chart. The low hanging fog-bank is his first impediment; his lack of exact position a second. If only, however, he had read up briefly on the subject glaciation and applied its rules-of-thumb to the ragged skyline he scrutinizes so longingly no further difficulty in picking his particular summit would be found.

Is not this, too, a vital study for the navigator?

Mountain Forms

The following quotation is selected at random from our Coast Pilot for the Pacific Coast (California, Oregon and Washington) page 147. Its wording is characteristic:

"Saddle Mountain, double-headed, and 3,266 feet high, is the landfall for this section of the coast and in approaching the Columbia River. It lies 14 miles 82° true from Tillamook Rock lighthouse, and is visible 50 miles offshore."

That is all. For the coastwise man who passes Saddle Mountain a hundred times a year it is sufficient. But for the tramp cruising of a navy navigator such description falls just short of being really valuable. What a shame too! "Visible 50 miles offshore." And the particular landmark for making a landfall hereabouts.

This is not a carping criticism. Whimsical visibility of the West Coast often lets one see the distant ranges over fog that hides all coast-line absolutely. A trifling eminence like Saddle Mountain means nothing in that land of natural sky-scrapers. To recognize it from the above description requires having seen it at least a time or two. I speak from recent personal observation. What then of the unfortunate individual who never has seen it at all?

No wish is had to clog our sailing directions with geological minutiæ. In this particular illustration a sentence more would have sufficed: *Saddle Mountain, block-type lava dome with a single glacial col, horns NNE-SSW.* At once a navigator who

understood simple topographic language could spot his landmark.

The same Coast Pilot dismisses Bald Mountain near Cape Meares with even scanter courtesy: "Bald Mountain, 550 feet high, is an irregular hill close to and eastward of the southern part of the cape." Not much of a mountain to be sure. But one that could be fixed for recognition far at sea just by addition of a technical word or two. And such simple recognition may always mean the saving of a ship.

It is nowise necessary to master strict geology of a mountain range just to recognize its single peaks. Nor is it by any means important that the navigator be always correct in his estimate of particular classification. The profit lies here, as in other features we have listed, more in habit of mind than in a pseudo-scientific geologizing. If the navigator will only learn to fix in his memory or in his notes that a mountain is a certain form of volcano or glaciated peak he will ever afterward recall it with an ease and accuracy surprising.

Technically a mountain is defined as "an elevation upon the earth's surface that rises above the general level of the country." It is customary among physiographers to draw the line between hill and mountain at an altitude of 1,320 feet. The trouble is that to the tired explorer who named the original eminence it may have looked mountainously high at the time. Witness "Bald Mountain" above.

Formation of a mountain may be traced to three causes: volcanic ejection, folding from terrestrial pressure, and faulting from either or both. Shape of a mountain developes from a combination of its origin with the particular kind and extent of erosion which it has undergone.

Mountains of our east coast are old and worn; and, in consequence, low and rounded. On the west coast they are generally young and sprightly, rakish coxcombs in the sky. Northern mountains are mostly glaciated. Southern mountains are worn by water in the eastern states; by weathered disintegration out West. In all states, and along all coast-lines, mountains may erode in different fashion according to the climate: be it wet or dry, and how severe the constant stress of each.

It is the special type outstanding in its own vicinity that is of

interest to the pilot. In enumerating them brief mention will be made of classic cases only. That some of these occur far inland, such as the red facades of the Grand Canyon country, does not mean their prototype is missing from the coasts.

The most spectacular mountain in the world is, of course, the volcano. When Pelee blew its head off twenty years ago it produced a hollow chimney of lava perfectly vertical, towering a thousand feet into the air. Such a core forms in the center of every lava volcano. When the mountain's outer shell is of softer material it weathers away leaving its core intact. Thus along the Japanese, Alaskan, Greenland, and Icelandic shore-lines we have what is popularly known as "Devil Thumbs." A volcanic plug of this sort often marks the side of a mountain well down its slope. It should always be looked for in a volcanic country, as it provides an ideal beacon. Other forms are shown in figure 2.

Another widely diverse class of mountains is marked by exposure and subsequent emergence of hard layers of underlying rock that once formed the level plain from which the mountain rose. A good example is the common "hog-back." This is simply a rough ridge which, if scrutinized, is found to be the termination of a series of rocky laminæ that wear away more slowly than the slope under which they lie. In the Grand Canyon we find superb battlements where the hardest layers of sedimentaries, having withstood the attack of weather, tower undaunted in their glory. Every now and then along New England coasts are jagged ridges standing out knee-deep in surf and sand, too hard for quick surrender to the climate.

Then there is that tragic class of mountains which are not mountains at all, but the skeleton of what was once a self-respecting plain. Such mountains are formed where cutting rivers, either ice or water, carry all away but a few remaining mesas. Thus there are lofty mountains in the very middle of the Grand Canyon. "Zoroaster" is one. Those nubbled islands that dot the coast of Maine are frequently called mountains, whereas they are but remnants left by ice that scoured the basement rock away.

On portions of the Chinese coast mineral crystallization has determined what forms the hills will take. There are stretches south of Halifax which might have been cut by human hand, so

perfect are the contours of their ice-smoothed heights. In Zanzibar are said to be such curious examples of block-faulting that geologists travel half around the world to see them.

There are innumerable mountains at the bottom of the sea, many of them far more magnificent than peaks we find on land. How little we ken of sub-sea mountain ranges may be judged from the fact that for the three oceans best known to man there is on the average (outside the 1000-fathom line) but one sounding for every 12,000 square miles in the Atlantic, one for every 25,000 square miles in the Pacific, and one for every 26,000 square miles in the Indian Ocean. According to Faris there is one region of 2,000,000 square miles "that has never felt the cast of the sounding line."

On January 24, this year, we received a report from Rear Admiral Halstead saying a destroyer commander doing ocean survey work had discovered that one depth of 10,800 feet in the Pacific had decreased to 200 feet. In other words a mountain over ten thousand feet high had at this spot sprung into being. Readily then we may view our coastwise peaks with new suspicion. By no means are they the perpetual titans of a ponderous continent, but really rather restless mounds which slide and shift like so much wet clay, or rise and fall with the caprice of the elements.

But we are sailors, not geologists. What the magna—as they call terrestrial putty—is we do not care nor want too much to know. What we are after is the safety of our ships. And when the Coastal Pilot is vague, when visibility is even vaguer, we want to be able to grab a bearing on a distant summit and know with confidence what peak it is we've used. The chart may have a picture of the mountain engraved upon its corner. But, likely as not, we'll be looking from quite a different direction than that in which the photographer once pointed his lens. Our only honest hope of recognition lies then, not in defining the single aspect the mountain can present from some preordained direction, but in classifying its particular form and type so definitely that no chance of error can exist.

Conclusion

The idea then is not to foist new difficulty upon the naval service. Nor is there any damaging criticism implied against the

splendid structure of our pilot charts and pamphlets. What is offered is simply a means to aid the memory, and to develop what is probably the most important branch of our profession after all. Navigation, you know, did much to settle Jutland.

Principles of geology went into the campaigns Foch fought in 1918. Air-men study geological features always. The commercial mariner uses them more than he will ever care to admit. Is it fantastic then to urge such thoughts upon a scientific life like ours?

Let it be understood distinctly that the value of some exceptional coastal peculiarity upon which the pilot may usually rely is in no sense underrated. But these peculiarities are by no means always visible. Nor are they always in sight just where he expects them to be. The pilot then is forced to turn to some larger and broader idiosyncrasies of the coast-line for locating himself. Geology invests these idiosyncrasies with reason.

Another point in use of geological features to aid in recognition of a coast is that one cannot expect always to find exact examples of the theory. Erosion from various causes, as has been shown above, is always hard at work to dim original formations. Sharp lines smooth off; one disturbance overlaps another. But if fundamental principles be known then geography of piloting becomes an open book. To a child the printed page is a haze of unintelligible characters. As he learns to read he sees with a thrill the hieroglyphics form words, the words form sentences, each a thought by itself. So is it with the use of land features as aids to navigation. The coast of tumbled rocks, or jagged peaks, the shore of precipitous bluffs and sand-spits, turn strangely into simple, readable, illuminating meanings that help the hollow-eyed navigator in his grievous task.

It is a new game, a fascinating professional pastime; and one which is bound to develop the sleuthing faculties of the officer who tries it.

A SUGGESTION REGARDING BATTLESHIP ORGANIZATION

By Lieutenant Commander J. K. Esler, U. S. Navy

IT IS my purpose in this article to point out, in the present organization of battleships, a condition absolutely opposed to the basic principles of strict military control; to explain why the present organization is fundamentally wrong in principle and practice; and to suggest a method of correcting the fault with the minimum change from the present duties and responsibilities of officers and men concerned, in such manner as is consistent with a well-balanced and effective military organization.

There can be but one head of a military organization, whether that head be represented by an individual or by a group of individuals. In the same way each primary sub-division of the main organization, forming a distinct military organization in itself, must have at its head an individual or group of individuals vested with absolute authority in that sub-division, subject to the direction and supervision of the head of the main organization and responsible to it. The efforts of the several smaller organizations are co-ordinated by the head of the main organization. Each primary sub-division of the main organization is divided into distinct subordinate organizations, and these in turn into smaller organizations, each head of an organization responsible directly to the head of the next higher organization, and subject to his supervision and direction.

The present battleship organization is shown in chart form in Plate I. It will be noted that the deck division officers, with the men assigned to their divisions, are responsible directly to both the gunnery officer and the first lieutenant. The former is responsible to the commanding officer for the gunnery efficiency of the ship, and the latter for its cleanliness and material condition. The practice of having two heads of departments, vested with equal authority, endeavoring to get entirely different results from

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the same group of men is in violation of the first principles of strict military control.

Any organization is very likely to become unbalanced if not closely watched. For instance, in one navy yard a progress section was established, and under an able leader became far more important and more expensive than its purpose warranted. In another the planning and estimating section practically disappeared. In a military organization it is quite possible that a new department might be created for the performance of some particular duty or the assumption of some definite responsibility, without due regard to the effect of the change upon the ship as a whole, and even without giving sufficient consideration to possible duplication of responsibility and authority.

The office of first lieutenant was initiated to relieve the executive officer of some of the more routine duties and responsibilities. On the older and smaller ships the executive officer had no difficulty in handling both personnel and matériel. As ships became larger, and crews increased in number, it became customary to appoint a junior officer as an assistant to the executive officer. His duties consisted in making routine inspections and in keeping records. The necessity of having greater rank for this officer, and the desirability of having a representative of the Bureau of Construction and Repair on board ship, led to the establishment of the office of first lieutenant as an independent head of department.

That there is duplication of both authority and responsibility is shown by the following extracts from the Navy Regulations in effect at the present time:

(a) (the executive officer) . . . . and may, as the representative of the commanding officer, direct all officers attached to the ship as to the cleanliness and good condition of all ammunition stowage spaces and cleanliness, good order, efficiency, and neat and trim appearance of the ship and crew. Art. 933 (e)

(b) The gunnery officer shall be held responsible . . . . and for the cleanliness and good condition of all ammunition stowage spaces and ordnance workshops, and of all ordnance storerooms not turned over to the supply officer of the ship. Art. 963 (1)

(c) He (the engineer officer) shall be responsible at all times, whether underway or at anchor, for the good order and cleanliness of the engineer department . . . . Art. 991 (1)

(d) He (the engineer officer) shall be responsible for the cleanliness and good condition of all bulkheads, doors, valves, pipes and machinery within the engine room; of the boiler rooms, shaft alleys, coal bunkers, firemen's wash rooms, engineer and electrical storerooms and work shops; of all dynamo rooms, distribution rooms, interior communication rooms, and storage battery charging stations; and of all compartments and double bottoms within the line of such bulkheads, together with those compartments and double bottoms accessible only through the engineer compartments. Art. 986.

(e) The navigating officer shall be responsible for . . . . and of all compartments occupied by the steering machinery, the interior of the conning tower and chart house, navigator's office and storerooms . . . . Art. 1008.

(f) The officers of the supply corps shall take charge of the office, store and other rooms under their charge, which are kept locked, keeping the keys in their custody. They shall see that store and other rooms under their charge are clean, dry, well ventilated, and in good order, and that they are prepared for inspection at the same time as the other parts of the ship. Art. 1218.

(g) He (the supply officer) shall be responsible for all mess gear issued to the crew, and for the cleanliness and good condition of the galley, bakery, issuing room, and other places where men of his division work. Art. 1213.

(h) The first lieutenant shall be responsible for the cleanliness, good order, efficiency, and neat and trim appearance of the ship as a whole, and of all parts thereof; and he shall have the necessary authority, as the representative of the commanding officer, to enable him to carry out his duties in this respect. Art. 1041 (1).

(i) He (the first lieutenant) shall be responsible for the cleanliness and good condition of all compartments and double bottoms, and of all bulkheads, doors, valves, and pipes within them, except those specified as coming under the supervision of the engineer officer. He shall be responsible for the cleanliness of the casings, and of the bulkheads around all machinery, outside of the engineer compartments, and all pipes (including the smoke pipes), hatches, ventilators, and bulkheads on the berth and upper decks, with such exceptions as may be directed by the commanding officer. Art. 1041 (2).

(j) The first lieutenant is the construction officer of the ship and is the head of the construction department of the ship. . . . . Art. 1042.

It would appear from the foregoing that several officers are jointly responsible for the cleanliness and good order of various parts of the ship. First, each head of department is responsible for compartments and store rooms used by his department; second, the first lieutenant is responsible for the cleanliness and

good order of the ship as a whole and all parts thereof; and third, the executive officer is specifically authorized to direct all officers as to the cleanliness, good order, efficiency, and neat and trim appearance of the ship. By eliminating those parts of the ship for which some head of department other than the first lieutenant is responsible, it will be found that his responsibility as regards cleanliness, good order, neat and trim appearance, etc., of the ship, will be confined to those parts of the ship ordinarily under the cognizance of the deck division officers, and the special artificers of the construction department.

To avoid duplication of both responsibility and authority, either of which is intolerable in a strictly military organization, it will be necessary to do one of two things, either relieve the first lieutenant of responsibility for parts of the ship under the cognizance of other heads of departments, or relieve other heads of departments of the responsibility for the cleanliness and good order of the parts of the ship used by their departments, and furnish men for cleaning these parts of the ship from some source other than these departments. The latter is obviously impracticable. The former is practicable.

Is there any particular reason for having a first lieutenant checking up the other heads of departments? Are they not fully as capable as he to run their own departments? Have they not as responsible a position, and as fine a sense of responsibility as he? Are not the men who are required to maintain the various parts of the ship in satisfactory condition the same men who work in these parts of the ship in the performance of their various duties, subject to the orders of the head of department who is, jointly with the first lieutenant, responsible for the cleanliness and good order of these compartments?

The engine rooms and fire rooms, together with the double bottoms under the cognizance of the engineer officer, are specifically excepted from the responsibility of the first lieutenant. In this single instance there is duplication of neither responsibility nor authority. The parts of the ship coming under the cognizance of the deck division officers are definitely assigned to the responsibility of the first lieutenant. In this case there is duplication of authority over the men of the deck divisions, but no duplication of responsibility. In all other cases the heads of departments

share their authority over their men, and the responsibility for the condition of the parts of the ship assigned to them, with the first lieutenant. If we except the comparatively unimportant part actually assumed by the first lieutenant in the condition of the parts of the ship assigned to the navigator, gunnery officer, and medical officer, it will be seen that a very considerable portion of his duty consists in looking out for the condition of galleys, bake shops, store rooms, etc., practically all of which are used by the men of the supply department.

Have the officers of the supply corps cleverly managed to evade, in this way, the responsibility for the condition of the parts of the ship used by them, or have the line officers managed in this way to avoid relinquishing to the officers of the supply corps the authority and responsibility usually accorded the line officer? Is there any question as to whether or not the officers of the staff corps are competent to assume the responsibility for complete control of their men? It is not believed that if this question could be put to a vote of all officers in the service, there would be a single officer, line or staff, who would care to go on record as stating that staff officers are incapable of taking full responsibility for the work of their men and the condition of their compartments. But the result is the same, regardless of who managed the present system of dual responsibility, and it is certain that in most cases supply officers are content to let the first lieutenant take the responsibility for the condition of the parts of the ship assigned to the supply department.

In this analysis of present conditions it is extremely difficult to find reasons justifying the insidious instigation of the functional management principle into the purely military organization of a battleship. It is convenient for the commanding officer to have some one line officer of head of department rank whom he can hold responsible for everything on the ship relating to cleanliness, preservation, and general appearance. It is convenient for the Bureau of Construction and Repair to have some line officer on each ship charged with the expenditure of their allotment and the maintenance of the hull book. But it must have been a much more powerful reason than either of these to have justified a departure from the strict military control essential to the success of a military organization.

There is one department on a battleship under the present regulations which is a strictly military organization. This is the engineer department. Here is no duplication of authority or responsibility. It is too essential that the ship be able to operate to permit any division of responsibility. It is true that the present over-enthusiasm for gunnery exercises may interfere seriously with the maintenance and operation of the engineer department, but only through regular military channels and at the entire responsibility of the commanding officer. Aside from this all men of the engineer department are subject to the orders of the engineer officer and the engineer division officers at all times, and these officers are responsible for all work performed by the men of their department. There is no adequate reason for departing from the strict military control of other departments, and there is reason to believe that, with strict military control, other departments could be brought to the standard of efficiency maintained by the engineer department.

The condition on deck at present must be obviously unsatisfactory to any one who has made even a cursory study of organization. The gunnery officer and the first lieutenant are working at cross-purposes in attempting to make good in their assigned duties. In many cases they co-operate very well, dividing the time of the men of the deck divisions so that a minimum of friction results. In other cases they do not co-operate so well. In either event the executive officer must co-ordinate the activities of both departments. To do this with fairness and justice he must be cognizant of the details of the requirements and the relative importance of the demands of both departments. If both heads of departments are more than usually energetic and anxious to make good at their jobs, the ship becomes a work-house unless the executive officer actually takes active charge of all activities of the deck divisions. Great credit is due the executive officers of battleships that the present double-headed organization has succeeded as well as it has. The old saying that it takes a good man to run a poor organization is especially applicable.

The executive officer, as the representative of the commanding officer, is charged with the co-ordination of the work of all departments, and the active management of none. He should not be a bit more concerned with the details of the gunnery and

construction departments than with the engineer or medical departments. In a strictly military organization each head of department would be responsible to him, as the representative of the commanding officer, for the condition and operation of his own department. Each head of department would be responsible for all work done by the men assigned to his department, and would have complete authority over these men within the limitations fixed by the commanding and executive officers.

In Plate II is shown in chart form an organization which it is believed will eliminate all duplication of authority and responsibility. There need be very little change from the present duties of officers and men, the principal variation from the present organization consisting of a reassignment of responsibility. By far the most important change is the elimination of the first lieutenant as a separate head of department and his assignment as an assistant to the gunnery officer, charged with the responsibility for all activities of the deck divisions. Minor changes, such as the assignment of the carpenter and the C. and R. artificers to the engineer's force, the division of the C. and R. allotment among the various departments in accordance with the requirements of each, and the assignment of responsibility for the hull book and in consequence the material condition of the ship as a whole to the executive officer, will be considered separately and in detail. The inclusion of the radio and communication officers under the cognizance of the navigator is shown as a part of the balanced military organization, and is advocated without that discussion which is considered beyond the scope of this article.

In recommending that the first lieutenant be eliminated as a head of department, it is not intended that the duties of the other heads of departments in standing watch be increased. It is believed that both gunnery assistants and the senior assistant engineer officer should be of sufficient rank and experience to justify their being assigned to duty as head of department watch in port. This would result in a watch in six instead of a watch in four as at present. One of the greatest advantages resulting from giving responsibility to younger officers is in their training to shoulder responsibility and to exercise the authority given them both moderately and wisely.

Since the period of the war many turrets have been assigned

to officers of low rank and little turret experience. The gunnery officer has not the time to supervise turret drills as closely as he might desire. The fire control officer is fully occupied with duties which do not include close supervision of turret drills. Turret officers are for the most part left to their own devices in developing efficiency in their turrets. It is believed that the benefit to be derived from having an experienced officer placed in charge of all turrets and broadside divisions would be invaluable in standardizing the procedure at drills and in teaching methods of co-ordinating the efforts of the component parts of the battery under the conditions to be anticipated in the preparation for battle. This duty could be performed to advantage by the officers who are at present acting as first lieutenants, if relieved of their supervision of parts of the ship not under the cognizance of the deck divisions. These officers would then become as much interested in the gunnery efficiency of the ship as in its appearance, and could plan the work and drills of the deck divisions in such a way as to get the best results. This duty need not interfere with the present battle station of these officers in central station, or in their responsibility for ground tackle, etc., in getting underway or coming to anchor.

Ships' carpenters have as a rule advanced to warrant or chief warrant rank through especial ability in some one of the artificer ratings. Few if any of them are expert in all of the various trades represented. The first lieutenant has but a superficial knowledge of the trades included in the group of artificers in his department. In this time of specialization, the engineer officer is probably the one officer on board best qualified to supervise the maintenance and operation of machinery, and direct reports and alterations under the cognizance of the Bureau of Construction and Repair. Because of the efficient military organization of the engineers' department, he would be able to do this in conjunction with the work of that department. The C. and R. artificers, numbering at the most twenty-five or thirty men, with all their exaggerated responsibilities, would be absorbed into the engineer department like a stone dropped into a pool of water, with only a momentary ripple on the surface. The Bureau of C. and R. would benefit in better maintenance of machinery due to more expert and closer supervision; the engineer officer would

benefit by gaining control of the expenditure as well as the supply of fresh water.

Each Bureau of the Navy Department has a quarterly allotment of funds for the maintenance of its equipage on board ship. The expenditure of this allotment is entrusted to the head of the department representing that bureau on board each ship, subject to certain conditions and restrictions. But Bureau cognizance does not coincide with the cognizance of the various ship's departments. The engineer officer is responsible for many of the C. and R. auxiliaries. He must ask the first lieutenant for material to repair and maintain in operation the steering engine, the anchor engine, the ventilating motors, crane motors, deck winch motors, fresh water and flushing pump motors, coaling engines, electric bake ovens, galley air compressors, etc. Each department must apply to the first lieutenant for paint for bulkheads and double bottoms throughout the ship. The matter of expenditure of the allotments of the various bureaus is more complicated than would appear at first glance. Certainly a large per cent of the C. and R. allotment is expended by other departments than that represented by the first lieutenant. The necessity for having a separate head of department responsible for the expenditure of the C. and R. allotment is not readily apparent. It is rather exasperating to the engineer officer toward the end of the quarter to find out that the first lieutenant has used up the allowance for the quarter and that he can not get paint for the engine room bulkheads in preparation for Admiral's Inspection. He will generally find that everything on deck has been freshly painted. It would seem preferable to divide this particular allotment between the various heads of departments in accordance with the requirements of each. The Bureau of Construction and Repair must have data showing the number of times per quarter it is necessary to paint galleys, living compartments, machinery spaces, turrets, superstructure, bridge, magazines, etc. They must know how much money is required for machinery maintenance, cordage, cleaning gear, etc. It would appear to be a very simple matter for the expert Naval Constructor to apportion the allotment of the Bureau of Construction and Repair equitably among the various departments on each individual type of ship.

Under the proposed military organization, each head of department would become solely responsible to the commanding and executive officers for the material condition, cleanliness, and good order of the parts of the ship assigned to his department. Each would be responsible for the periodical hull reports. Who could more appropriately be charged with the responsibility for the hull book than the executive officer, in his capacity as the co-ordinator of all departments? The C. and R. blue prints of the hull cover all parts of the ship, under the cognizance of all departments. Should not the executive officer be the one to keep these blue prints intact and ready for reference by all heads of departments?

One of the first serious objections to the adoption of the proposed military form of organization will probably be on the grounds that the gunnery officer has enough to worry him without assuming the responsibility for the cleanliness and good order of the parts of the ship assigned to the deck divisions, in addition to the gunnery training of the men assigned to these divisions. A little consideration will show that the gunnery officer gains rather than loses under the proposed organization. He gains the services of an experienced officer to supervise the training of the officers and men assigned to the turrets and broadsides. The most serious obstacle to his success is turned into one of the most helpful factors. The mere assumption of additional responsibility is a small matter to officers especially selected for such important duty as the gunnery officer of a battleship.

Some officers may contend that the executive officer will be overloaded by the additional work entailed in taking over the responsibility for the material condition of the ship and the custody of the hull book and hull drawings. It is believed that, with the gunnery officer relieving him of the necessity for mixing up in the details of the deck divisions, and the assumption of responsibility for the cleanliness and good order of the parts of the ship by the heads of departments concerned, his duties will be lessened rather than increased. He will have time for a clearer perspective of the ship and crew as a whole than he has at the present time.

The Service is more inclined to let changes grow than to adopt radical suggestions. Any changes should be the result of careful

consideration on the part of a number of officers best qualified to pass judgment on the subject. Changes, once decided upon, should be complete, especial consideration being given to possible duplication of authority or responsibility. The writer trusts that he has, in this article, pointed out the duplication of responsibility and authority existent under the present regulations, and that he has indicated in a general way, a means for correcting present conditions with an attendant increase in the efficiency of the Service.

PLATE I.

PRESENT BATTLESHIP ORGANIZATION

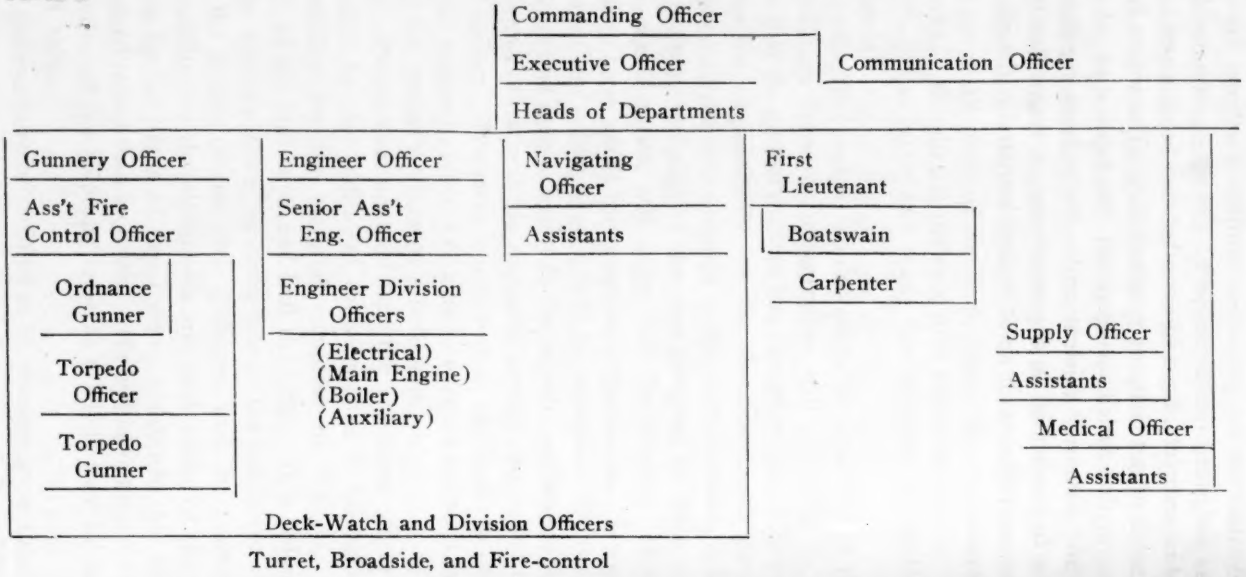
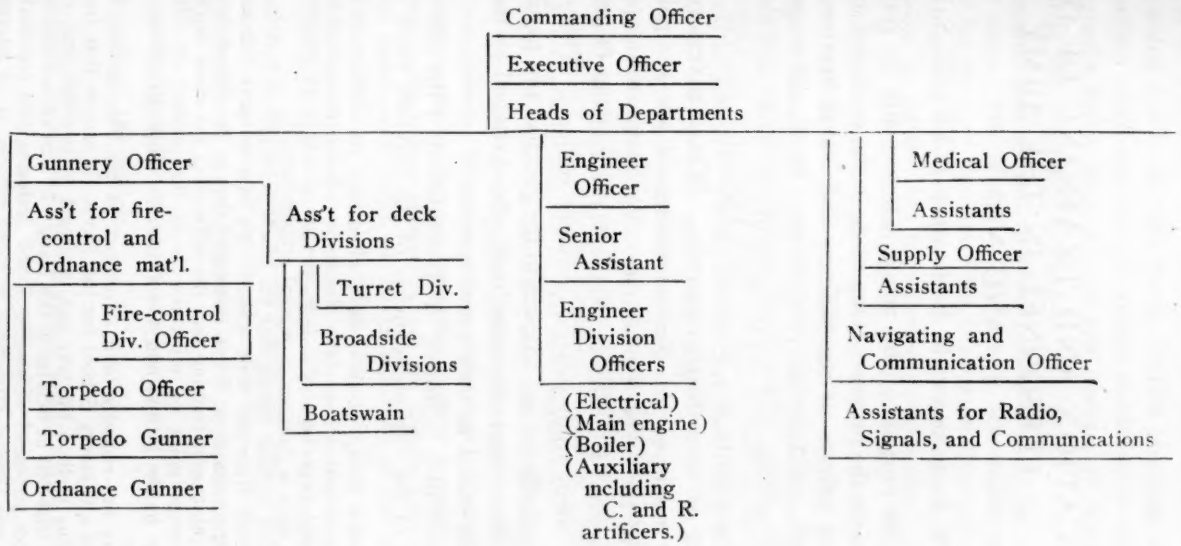


PLATE II.

PROPOSED BATTLESHIP ORGANIZATION



EDUCATION AND TRAINING OF OFFICER PERSONNEL IN THE ARMY AND NAVY

By Lieutenant R. E. Bassler (CEC), U. S. Navy

THE purpose of this article is to acquaint the Naval Service with the progress being made in the education and training of officers of the Military and Naval Services.

Brief summaries are given of the educational programs in the various bureaus and departments of the Army and Navy. Similar departments are discussed adjacently, and the parallelism existing is immediately apparent. Where necessary, the particular needs of the Service concerned are recognized in the scope of the respective courses. For instance, the personnel of the Bureau of Ordnance of the Navy and the Ordnance Corps of the Army study general ordnance subjects. Those studied by the naval officers are adapted to the peculiar and particular needs of the Navy, and correspondingly, those studied by the army officers are suited to their requirements.

Immediately following the presentation of the educational programs of the various branches of the services, there is a general

Editor's Note. In these days when both the Army and the Navy are confronted with what might almost be called a struggle for existence, it is of vital importance that both services should work together. The first step in such a direction is mutual acquaintance.

It goes without saying that the officer personnel in both services comes, in general, from the same source. No vast or vital difference exists between the training at West Point and that at the Naval Academy. It is in the subsequent training that the differences are more marked. Perhaps the greatest point of difference is in the number of Service Schools existent in the Army, and the extent to which all officers attend these schools.

There has recently been advocated, in the Proceedings, the establishment of a Gunnery School for the Navy. It may be that from a study of the Army method the way can be found to establish that, or some other school, that will be helpful to the Navy. In that connection, the percentage of officer personnel which it is found desirable, and practicable, to employ at any one time in attendance at these schools, is of interest. A careful investigation and study of the whole subject cannot fail to be of benefit to the Navy.

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discussion as to what the writer believes the tendency of education and training will be in the future. Before plunging into the detailed outlines of educational programs, attention is invited to three paragraphs below quoted from the *Bureau of Navigation News Bulletin No. 20,* April 4, 1923.

It is an accepted principle that all officers should be ready for examinations at all times. The number of failures to successfully pass the examinations has increased since the Navy Department Examining Board, in its effort to standardize the requirements for promotion of all officers, has been sending out the questions for supervisory examinations of officers not stationed in the vicinity of Washington or Mare Island. The records show that recently nearly twenty per cent of the officers so examined failed on supervisory examinations and were consequently required to appear before Statutory Boards for reexamination. Failure before the Statutory Boards, either on examination or reexamination, entails suspension from promotion to the next higher grade for a period of six months with consequent loss of numbers. Of the officers thus reexamined before the regular board, thirteen per cent have failed to pass.

The subjects in which failures have occurred cover the entire scope of examinations but were noticeably great in navigation and engineering. It, therefore, behooves officers to prepare themselves in all subjects. Examination papers are filed with the permanent records of officers, and it is desirable not only to pass but to pass good examinations.

There is little doubt but that any officer can pass the examinations if he has worked to prepare for them; the failures above noted are therefore due to one cause, namely, failure to prepare themselves. While the passing of a creditable examination for promotion is more a matter of particular interest to the officers themselves, yet the Bureau feels that the interest of the command in which the officer is serving is also promoted by a record of no failures. It is, therefore, requested that commanding officers give every assistance to officers now and hereafter due for examination for promotion. At the conclusion of the examinations now pending a table will be compiled showing numbers and stations upon which serving, but not names of individuals, of failures. This table may be useful in indicating the cause of failures, and if so it will be published to the Service.

The above paragraphs should be remembered when reading the conclusions of the article.

Educational Programs of Various Service Branches

Infantry, U. S. Army

Officers of the Infantry Service are obtained from West Point, or from civilian life by examination. Concurrently with troop

duty, each officer takes a one-year basic course in the Unit Schools of the command in which he is serving. Selected National Guard and Reserve officers also take a three months' course.

The Infantry School is located at Fort Benning, Ga., and all infantry officers and selected National Guard and Reserve infantry officers, and certain general officers take courses at this school. Captains and below take the officers' course which lasts for one year, and field officers and selected senior captains take the Advanced Course which is also for one year. Certain general officers who are likely to command Infantry Brigades take a refresher course which is of three months' duration.

About half of the infantry officers take the Tank School Course at Camp Meade, Md., which is of one year duration for regular officers, and three months for selected National Guard and Reserve officers.

Infantry officers are sent to other service schools, such as the Signal Corps Schools at Camp Vail, N. J.; Chemical Warfare School at Edgewood Arsenal, Md.; the Motor Transport School at Camp Holabird, Md.; the Engineer School at Fort Humphreys; the Air Service School at Langley Field; the Cavalry School at Fort Riley, Kan.; the Field Artillery School at Fort Sill, Okla.; the French Tank School at Versailles (four months' or one-year course); the Ecole de Guerre (two-year course), and the Naval War College.

The Infantry Branch is also allowed to send two per cent of its officers to civilian technical institutions in order to prepare them for particular details. In the past, Yale, Illinois, Chicago, Colorado, Cornell, Johns Hopkins, Massachusetts Institute of Technology, Texas, and others have been used.

Senior Infantry officers(X) are also sent to the Command and Staff School at Fort Leavenworth, and to the Army War College later in their careers.

NOTE (X):

Section 5 of the Act of June 4, 1920, provides for officers of the General Staff. Officers of the various branches of the service take the Command and Staff School Course at Leavenworth, and upon satisfactory completion of the same, and upon the recommendations of the Leavenworth School and a Washington Supervisory Board, they are eligible for General Staff duty with troops only. After the Army War College

Course has been successfully completed, officers automatically become eligible for any kind of General Staff duty.

Cavalry, U. S. Army

Up to 1921, officers obtained from West Point or from civil life, for assignment to the cavalry service, were given the Basic Course of Instruction at the Cavalry School, Fort Riley, Kan. This course was one year in length, but now it is given concurrently with field duty with troops. After this training, the Troop Officers' Course at the Cavalry School is taken, and this is one year in length.

At this point in the officer's career, he may, upon application, be sent to Yale for the Communications Engineering Course, to Princeton for languages, or to the Signal Corps Communications Course at Camp Vail, N. J. Each of these is for one year.

Upon reaching the grade of captain, officers generally take the Field Officers' Course at Fort Riley, which is five months in length. When the grade of major is reached, or maybe before, officers are sent to the Command and Staff School, Fort Leavenworth, Kan., for a one-year course, and if their previous record, and the record made at this last school warrant it, they then become eligible for the one-year course in the Army War College.

Coast Artillery, U. S. Army

Officers are obtained from West Point, or from civilian life after examination, and during their first year are given the basic course concurrently with their troop duty. As soon as possible after this, they are sent to Fort Monroe, Va., for the Battery Officers' Course which lasts for one year. Incidentally it might be pointed out that in 1924 this service school will be one hundred years old, and it is claimed that it is the oldest service school in existence. Upon reaching the rank of major, the advanced course at Fort Monroe is taken, consisting of studies in command, artillery staff work, logistics, etc. After the completion of this one-year course, officers are sent upon application and selection to the Command and Staff School at Fort Leavenworth. After the satisfactory completion of this one-year course, and if recommended, they are sent to the Army War College.

In addition to the above service education, the Coast Artillery

Service is allowed to send two per cent of its officer strength to civilian technical institutions. The subjects studied in the institutions selected are listed below.

University of Chicago—Ballistics.

Harvard University—West Point Instructor Course.

Columbia University—Radio Engineering and Fire Control.

University of Iowa—Acoustics.

Massachusetts Institute of Technology—Electrical Engineering.

Yale—Communications.

Officers of the Coast Artillery Service are also sent to the Naval War College, and to the Ecole de Guerre (two-year course).

Field Artillery, U. S. Army

Officers obtained from West Point, or appointed from civilian life (after examination and assignment to the field artillery service), are during their first year given the basic course in field artillery while on regular troop duty. As soon as possible after the completion of that course, they are sent to Fort Sill, Okla., for a one-year Battery Officers' Course. They next have troop duty for several years. Upon reaching the rank of major, the advanced course at Fort Sill is taken, consisting of studies in command, artillery staff work, logistics, etc. After the completion of this one-year course, they are eligible to apply for the Fort Leavenworth Command and Staff School Course, which also lasts for one year. They then have an interval of troop duty, and those making the best record at Fort Leavenworth are eligible for further instruction at the Army War College.

In addition to the above service education, the Field Artillery Service is allowed to send two per cent of its officer strength to civilian technical institutions. The university selected depends on the subject to be taken, and the following have been used in the past.

University of Chicago—Ballistics.

Yale University—Communications Engineering.

Massachusetts Institute of Technology—Automotive Engineering.

University of Iowa—Acoustics.

Signal Corps, U. S. Army

The personnel of the Signal Corps is obtained either from West Point, or from civilian life. Civilians entering the Signal Corps take the general examination for entrance into the Army and then a special examination for entrance into the Signal Corps. The basic course of one year duration is given concurrently with troop duty, and the Company Officers' Course in Communications is given them as soon as possible after the completion of the basic course. There is under preparation an advanced course of one year duration, which will also be given at Camp Vail, N. J. Field Officers are eligible for the one-year Command and Staff Course at Fort Leavenworth, and upon satisfactory completion of that course, and if recommended, they next are sent to the Army War College.

Certain officers are designated to attend the Sheffield Scientific School at Yale, where they take a special course outlined by the office of the Chief Signal Officer, which is called Communications Engineering. It is planned to put all officers through the Camp Vail course, and certain designated officers through the Yale Communications Course, and the Iowa University Acoustics Course.

Medical Corps, U. S. Navy

Officers of the Medical Department, U. S. Navy (including both medical and dental officers) are selected after examination, from recent graduates of Class "A" Medical or Dental colleges of the United States. Immediately after their appointment, if they have had no hospital experience, Medical Officers are detailed to one of the larger base hospitals of the Navy as internes for one year. They are next sent to the Naval Medical School for a four months' course which is followed by two years of sea duty. The Naval Medical School Course is a postgraduate course in Naval Medicine and Surgery, and includes a study of the latest developments in laboratory work, hygiene, internal medicine, military surgery, and aviation medicine. Dental officers take a similar professional course at the Naval Dental School.

After their first cruise, officers who show special aptitude in any medical specialty, such as surgery, dental surgery, x-ray, etc., are given special courses of instruction in those specialties at the various larger clinics in the United States. These include Mayo

Brothers' clinic at Rochester, or clinics at Baltimore, Boston, Philadelphia, St. Louis, and San Francisco.

Certain medical officers are detailed to Mineola, L. I., N. Y., where they receive special instruction in aviation medicine. Other officers are detailed to Edgewood Arsenal, Md., where they take the Chemical Warfare Service Course. In order to prepare for duty with the U. S. Marine Corps, officers (medical and dental) are sent to Carlisle, Pa., where they are given instruction in field service under the supervision of the Medical Corps of the Army. Certain officers are detailed at times to institutions in order to prepare themselves for special duty, and the London School of Tropical Medicine, among others, has been used in the past.

Certain senior medical officers are detailed to the Naval War College each year for the one-year course at that institution.

Certain dental officers are now undergoing specialized training for dental laboratory and prosthetic work at the Navy Dental School which will be continued until all dental officers are conversant with this specialty.

Medical Corps, U. S. Army

NOTE: Under this heading will really be considered four different corps: viz., Medical, Dental, Veterinary, and Medical Administrative Corps.

Medical Corps Officers are selected from graduates of Class "A" Medical Schools who have had one year of interneship. They are examined, and upon successfully passing, are commissioned in the Reserve Corps, serving four months in that corps, at the end of which they are commissioned, if acceptable, in the Medical Corps. The Medical Corps also takes graduates of Class "A" Medical Schools immediately after graduation, provided they are recommended for commission by the faculty, and stand high in their class. They are then sent to serve as internes in Army General Hospitals, and at the end of one year's interneship enter the Medical Corps without examination.

The Dental Corps demands that its officers be graduates of a Class "A" Dental School and have in addition, two years of practice.

The Veterinary Corps accepts graduates of Class "A" Veterinary Schools plus one year of professional experience.

The Medical Administrative Corps is open to former enlisted men in the Medical Department. They must have had two years of enlisted service, however, and after a competitive examination are commissioned as second lieutenants, and reach the grade of captain after ten years commissioned service. The members of this corps are limited to the rank of captain.

The Medical and Veterinary Corps appointees are given a basic course, the first part of which consists of the medical Field Service Course, which is the same for all three branches, of four months' duration, and is taken at Carlisle, Pa. The second part of the course, of six months' duration, is really a Postgraduate Medical School of Military Medicine, in the particular profession, and these follow:

(a) Army Medical School, Army Medical Center, Washington, D. C.

(b) Army Dental School, Army Medical Center, Washington, D. C.

(c) Army Veterinary School, Chicago, Ill.

After the completion of these courses, officers are available for general service.

By preference of the individual, his efficiency ratings, and his superior officers' recommendations, certain officers are selected for special or advanced training in the following fields:

Aviation Medicine, 4 months, Mitchell Field, L. I.

Chemical Warfare, regular school course, Edgewood Arsenal, Md.

Command and Staff School, Fort Leavenworth, Kan., one year.

Army War College, Washington, D. C., one year.

Advanced Course in Public Health Work, four months, Army Medical School, Washington, D. C.

In addition to the above, certain officers are sent to civil technical institutions each year. The following have been used in the past for Medical Officers: Cornell, Johns Hopkins, Mayo Foundation, Pennsylvania, Harvard, Vienna, Berlin, and the London School of Tropical Medicine.

Dental Officers attend the Dewey School of Orthodontia at New York City, and Veterinary Officers attend Cornell and the Colorado State Agricultural College.

United States Marine Corps

Officers of the Marine Corps are now obtained from Naval Academy graduates, or graduates of recognized colleges where military training is included in the curriculum. Non-commissioned officers, after successfully completing a preliminary examination, are given a special seven-months' course at Washington Barracks followed by another examination, which if passed, is followed by a commission.

All newly-appointed officers are sent to Quantico to the Marine Corps School where they take the Basic Course of four and one-half months. Tactics, Infantry Auxiliary Weapons, Naval and Military Law, Topography, etc., are studied. After an interval of troop duty, they take the Company Officers' Course of one year duration, which in general, is an elaboration of the basic course, and prepares them for company command.

After another interval of troop duty, field officers and senior captains return to Quantico for the Field Officers' Course, which is also a one-year course.

Later, certain selected officers are sent to the Command and Staff School at Fort Leavenworth, the Army War College, and the Naval War College which are each of one year duration. In addition to the above, certain selected officers are sent each year to the Fort Benning Infantry School where they take the officers' course, and the advanced course as outlined under Infantry, U. S. Army. Other officers take the one-year Postgraduate School Course at Annapolis, and then attend a civilian technical institution for one year in order to prepare themselves in special subjects. Massachusetts Institute of Technology, Harvard, and Cornell have been used in the past.

The Marine Corps also sends officers to the following service schools: Signal Corps School, Camp Vail, N. J.
Motor Transport School, Camp Holabird, Md.
Chemical Warfare School, Edgewood Arsenal, Md.
Air Service School, Kelly Field, Tex.

The Tank School at Camp Meade, and the Engineer School at Fort Humphreys are also under consideration.

Marine Aviators are trained at the Naval Air Station, Pensacola, Fla., where they take courses as outlined for naval aviators under the Bureau of Aeronautics.

Chemical Warfare Service, U. S. Army

The commissioned personnel of the Chemical Warfare Service is obtained from U. S. Military Academy at West Point, appointed from civilian life, or by transfer from the other services. At the present time the greater proportion of their officers have been obtained by the last named method. These officers have, with a few exceptions, had considerable duty with troops and have completed the basic, and in many cases the advanced courses, of the school of the arm from which they were transferred.

Upon transferring to the Chemical Warfare Service, all officers are sent to Edgewood Arsenal for a three months' course in the Chemical Warfare School, and as a rule do duty with gas troops or technical work at the Arsenal before being assigned to duty in Washington, or in the various corps areas. All officers of field grade are sent to the Command and Staff School at Fort Leavenworth, Kan., and later to the Army War College, with suitable duty in the Chemical Warfare Service between these two courses.

In addition to the above, it is customary for officers who expect to attend the Service School at Fort Leavenworth to spend a year in the advanced school of some line arm, in order to take a refresher course prior to entering the Leavenworth Schools.

Two per cent of the officers of this service are eligible for detail as students in civilian institutions, and at the present time a course is being outlined at the Massachusetts Institute of Technology to which it is expected to send all the officers who receive such details from this arm. During the past year, such a course has been held at the University of California.

In order to complete an officer's education in a practical way, officers are detailed from time to time for duty at various industrial plants, such as Dupont and National Aniline and Chemical Companies factories.

Construction Corps, U. S. Navy

Officers are selected from the line after two years of sea duty, and after spending one year at the Postgraduate School at Annapolis, are sent to Massachusetts Institute of Technology for a two-year course in Naval Architecture, the first year of which corresponds to the senior year of the naval architectural course,

and the second year corresponding to postgraduate work. The subjects follow: alternating currents, alternating current machinery, business law, electrical engineering laboratory, internal combustion engines, marine engine design, marine engineering model making, naval architecture, political economy, shipyard practice, steam turbines, theory of warship design, aeronautics, business management, merchant shipbuilding, rigid dynamics, structures, warship design and thesis.

This work is supplemented by a further education program acquired in navy yards and shipbuilding plants.

Certain naval constructors are designed to take a six weeks' course at the Chemical Warfare School at Edgewood Arsenal, Md. The fundamental chemical principles and properties of the various chemical agents used, offensive and defensive matériel and their relation to tactics, etc., are studied during this course.

Judge Advocate General, U. S. Navy

Officers apply for a three-year tour of duty in the office of the Judge Advocate General. Concurrently with this tour of duty, a law course is taken at one of the local universities. Most officers take this course in the morning, and a few in the evening. After the completion of the law course, bar examinations are taken. Officers may or may not ever again be assigned to the office of the Judge Advocate General, but they are available with their specialized knowledge for duty on various court-martial proceedings, and in other capacities where legal knowledge is essential to a naval officer.

Bureau of Engineering, U. S. Navy

Certain officers, after five years of sea duty, upon submission of request, showing their desire to take postgraduate courses, and accompanied by letters of indorsement from officers under whom they have served, are selected for postgraduate courses in subjects under the cognizance of the Bureau of Engineering. The course covers the following sub-divisions: turbines, reciprocating engines, internal combustion engines, electrical design, electrical ship propulsion, and radio (including sound).

This course comprises one year at Annapolis where the students are given ground work in the Postgraduate School which will

enable them to take their places along with the university students who are usually sixth-year men. The Annapolis course is followed by one year at some university where the courses are arranged with a view toward the specialty selected. The summer periods are taken up with temporary duty at the most important inspection offices, manufacturing plants, and at the Bureau, where they become familiar with manufacturing conditions, inspection, and routine work of the offices and the Bureau. The university selected varies at times, depending upon the nature of the studies desired, and the character of the courses offered. Columbia, Harvard, and Michigan have been used in the past, and Yale, Iowa State, and others are under consideration for future assignments.

Air Service, U. S. Army

Officers for this branch of the service are obtained from West Point graduates or civilian life. As soon as they are assigned to the Air Service, they are given a course in flying (heavier-than-air or lighter-than-air) concurrent with ground work, since the National Defense Act provides that Air Service personnel must qualify as observers or pilots within one year after being so assigned. The heavier-than-air course consists of primary training followed by advanced training, the former consisting of three months ground work and five months flying, and the latter consisting of eight months advanced training at Brooks and Kelly Fields respectively. The lighter-than-air course consists of nine months training at Scott Field, Ill. They are then released for general service, and are given troop duty one year out of every five, this duty, however, being with Air Service troops.

Fifteen officers are permitted to attend other institutions each year, and the majority are given the Aeronautical Engineering Course at Massachusetts Institute of Technology. Others are sent to the Sheffield Scientific School at Yale for a course in Radio Engineering, and still others take Business Administration courses at Harvard University or the University of Pennsylvania. In general, these courses are two years in length.

Bureau of Aeronautics, U. S. Navy

Officers of the Navy or Marine Corps are selected for the Naval Aviation Observers' Course, which is of three months' duration.

This course includes aerial communication, aerial navigation and map reading, naval and aerial strategy and tactics, meteorology, photography, review of naval gunnery and fire control, bombing, and aerial fire control. In like manner selected officers are given a six months' Naval Aviator's Course at the Naval Air Station, Pensacola, Fla., which at present is a Training School for Naval Aviators. This course includes ground school work, primary flying, bombing, gunnery, aerial navigation, aerial radio, fleet duties, and preliminary advanced courses in combat, spotting and torpedo duties.

Certain naval aviators after five years of general duty become eligible for a postgraduate course in aviation engines, and power plant equipment. Upon selection, they are sent to the Postgraduate School at Annapolis for twelve months, and then to Massachusetts Institute of Technology for one year in Aeronautical Engineering. They also take a summer course of which six weeks are spent at the Naval Aircraft Factory, Philadelphia, Pa., and another six weeks at the Wind Tunnel and Engine Testing Laboratory at the Navy Yard, Washington, D. C., or private naval engine contractors for practical instruction in their shops. They are then released for general service.

At Massachusetts Institute of Technology, the postgraduates take courses in advanced calculus, theoretical aeronautics, laboratory work in mathematics, aeronautics and advanced aeronautics, mechanics, theory of elasticity, metallography, advanced wing theory, airplane, airship, propeller and advanced airplane design, and advanced airplane structures.

Certain line officers who have completed the regular postgraduate course in radio and ordnance specialties are assigned to the aeronautical organization for duty in connection with Aviation Radio equipment and Aviation Ordnance equipment.

Certain officers of the Construction Corps, after completing the Naval Constructors' course at Massachusetts Institute of Technology which includes aeronautics, are detailed to the aeronautical organization for the purpose of specializing in aeronautical structures, both lighter-than-air and heavier-than-air.

Quartermasters' Corps, U. S. Army

Officers are obtained from civilian life after entrance examination into the Army or from West Point. All officers are given the nine months' course at the Quartermaster Corps School, Philadelphia, Pa., where they are trained for quartermaster duties, studying administration, military organization, logistics, transportation, procurement, warehousing, construction, law, salvage, finance, and care of animals. Various textile and other manufacturing establishments are visited during this course.

Certain officers upon application are designated to the Quartermaster Corps Subsistence School at Chicago, Ill. Here they study production, manufacture or preparation, purchase, grading, inspection, storage and transportation of subsistence, supplies and forage, as well as the sanitation involved. During this eleven-months' course, the student officers visit packing houses, various flour and cereal mills, grain elevators, canning factories, etc.

Certain other officers after application are designated to attend the Quartermaster Corps Motor Transport Training School. There are three such schools, one of which is at Camp Holabird, Md. During this nine-months' course, the operation, maintenance and repair of motor transport equipment, allied trades, automotive engineering, and motor transport formations are studied and the student works in the shops and later makes convoy trips of several hundred miles. Industrial plants such as oil, steel, rubber and tire companies, and the Bureau of Standards are visited.

Certain higher ranking officers are sent to Fort Leavenworth for the one-year course at the Command and Staff School, and others to the Army War College for one year.

At present, officers are attending the following several technical institutions, California, Cornell, Michigan, and Massachusetts Institute of Technology for various special courses. At the invitation of the French Government, certain Quartermaster Officers are attending the Ecole de l'Intendance, which is the French Quartermaster School, and the Haras du Pin, which is the French Remount School. Each of these latter courses is for two years.

Supply Corps, U. S. Navy

The junior officers of the Supply Corps are being given opportunities to attend the Supply Corps School of Application. This is a four-months' course, and lectures are given by various people, professors of economics and finance, bankers, business men, etc. Other officers attend Harvard University, University of Pennsylvania, or New York University where they take special business courses. Some attend during the day, some, when assigned to duty in the vicinity of the university, attend school at night, and some attend both day and evening courses. Courses in law, banking, business, accountancy, ocean and rail traffic, etc., are taken by various men who are really specializing within their specialty. Still others are assigned to the Department of Agriculture in order to obtain experience in food stuffs, which will enable them properly to provide the Navy's food supply. Some are assigned to textile establishments in order to cover that portion of the Navy's purchasing field.

As an example of some of the special activities, a bank was established by a supply officer in Guam. No previous facilities had existed, and this bank is meeting with wonderful success, and has been sponsored by the commandant of the station. Those officers who fill such positions as financial advisers to Haiti, Virgin Islands, etc., take actual work in large banking institutions for months in order to prepare themselves for their positions.

Finance Department, U. S. Army

Officers for the Finance Department are obtained from West Point, from civilian life after examination, or from transfer from the line. They are given basic and advanced courses at the Finance School at Fort Hunt, Va. Here they study the laws and regulations governing the disbursement of public funds, the handling of public vouchers, Treasury Regulations, and the decisions of the Comptroller General.

After an interval of field duty, officers become eligible for selection to fill the annual quota at civilian institutions of learning, and there take such courses as business administration, accounting and economics. This is a one-year course, and more or less designed to fill the requirements of the Finance Department.

Leland Stanford and Harvard Universities have been used in the past.

In addition, officers in the vicinity of Washington are assembled periodically to hear lectures given by various men prominent in the field of banking, economics, business administration, etc.

A correspondence school course, originally designed for reserve officers, is now given all officers and takes for completion one year of study.

Senior officers are also sent to the Command and Staff School at Fort Leavenworth, and later to the Army War College.

Ordnance Department, U. S. Army

Officers of the Ordnance Department are obtained from West Point graduates, or those officers who have been commissioned after examination from civilian life, and who are graduates of recognized technical institutions. As soon as possible after officers have been assigned to the Ordnance Department, they are given two years of work, either of which may be taken first. One year is spent in the Ordnance School Course at Watertown Arsenal, Mass. Here they work on all sorts of machines in the foundry, in the gun forging plant, and in the erecting, smith, pattern and projectile shops. In addition, they study administration and take special courses in steam, power and compressed air at the Massachusetts Institute of Technology. They also spend about twenty-five per cent of their time in the chemical and testing laboratories where excellent courses in metallurgy, metallography, and testing materials are given.

The year spent at the Massachusetts Institute of Technology extends for the entire year, including a summer session. They study the theory of elasticity, with special application to gun design, heat engineering, ordnance engineering, chemistry of powder and explosives, and work in the gas engine, power, general chemistry, explosives and electrical engineering laboratories. After this general education in ordnance engineering, officers are trained further within their specialty, there being an artillery design course at the Rock Island Arsenal, other similar special courses at other arsenals, and special work at commercial establishments handling ordnance contracts.

Bureau of Ordnance, U. S. Navy

Officers become eligible for the postgraduate course in Ordnance after five years of sea duty. Selection is made from those officers who apply for this duty, and is based on their fitness reports and other submitted data. Officers so selected are sent to the Postgraduate School at Annapolis, after which they are sent to various universities, according to the specialty selected. There follows a list of the specialties studied at these universities:

Torpedoes and Ordnance Design at Massachusetts Institute of Technology.

Fire Control at Columbia University.

Explosives at University of Michigan.

Ballistics at Chicago University.

Metallurgy at Carnegie Institute of Technology.

The third year is spent several weeks or several months at a time in various manufacturing plants supplying ordnance material, in the Navy Yard, Washington, D. C., or at practical work in industrial plants.

Engineer Corps, U. S. Army

The Engineer Corps of the Army obtains its officers from West Point, or by assignment after having taken an entrance examination into the Army from civilian life. Graduates of technical colleges with a degree are given the five months' basic course at the Engineer School at Fort Humphreys, after which they take a year or two of duty with troops. They then return to the Engineer School for the Company Officers' Course, which lasts one year, and at a later time in their military careers, may be sent to civil technical institutions for additional technical education.

U. S. Military Academy graduates are also given the Engineer School Basic Course, after which they have a period of troop duty, and then return to the Engineer School for the Company Officers' Course, or to a civil technical institution for postgraduate work in engineering. After a preparatory course at a summer session, they enter the institution selected with the senior class in the fall.

After ten years of service, officers may be assigned to the Field Officers' Course at the Engineer School, and later to the Command and Staff School at Fort Leavenworth and upon satisfactory

completion of that course to the Army War College. Each of the latter two courses is one year in length.

Civil Engineer Corps, U. S. Navy

Officers are selected either from civilian life or from the line of the Navy. Those selected from civilian life have a specified amount of technical experience and an engineering degree from a recognized university, and after taking a five or six-day entrance examination, are generally given a short period at the Naval Academy to acquaint them with the Naval Service. It is planned to send officers selected from the line (after not less than one year of sea duty) to the Postgraduate School at Annapolis for one year, and then to Rensselaer Polytechnic Institute for a two-year course. After completing the first year at Rensselaer, these students will obtain a degree in civil engineering, and a master's degree at the end of the second year.

The following subjects are among the subjects studied: surveying, railroad location, architecture, steam and electric railroads, steam and electrical engineering, materials of construction, plain and reinforced concrete, masonry foundations, earth works, masonry, timber and steel structures, (bridges), hydraulics, water power, water supply and purification, sewers, irrigation, dams, aqueducts, piers, quay walls, harbor development, highway engineering, heating, ventilating, and refrigerating.

In addition to the program for Naval Academy graduates above, it is planned to send the younger officers to universities in order to broaden out their education or prepare them for a particularly special class of technical engineering. It is also planned to send all officers for short periods of duty on inspection, to steel manufacturing plants, and other places of interest to a construction engineer.

Certain other officers are assigned to take the Engineer Officers' Course at Fort Humphries, Va., under the supervision of the Engineer Corps, U. S. Army. Certain senior officers are detailed to the Naval War College yearly.

Conclusions

There is only one reason for discussing the subject of Education and Training of Officers, and that is to improve the efficiency

of the military department in which they serve. The appropriations granted by Congress to military departments at present when the Government is seeking by every means to limit the expenditures and enforce drastic economy are necessarily and rightly as small as is possible and consistent with proper protection of the United States in cases of emergency. We are, however, much more fortunately situated financially than other countries when compared on the basis of national debt per capita.

Assuming that the number of officers and men is unaffected and remains constant, decreased appropriations mean simply one thing, that there will be less money available for experiment, and for the improvement of existing weapons. A further conclusion would be that if existing personnel were sufficient to handle the development and improvement of weapons of warfare with normal appropriations, there would be a superfluity of personnel with decreased appropriations. How then can progress be made in spite of decreased appropriations? Only through additional education and training for military personnel. It should be noted here that this additional training and education may be indirectly considered as economy to the Government since the efficiency of the officer being trained will be increased. The cost is insignificant compared with that of the same officer acting as project manager in the development of, or experimentation with some military necessity.

It is well to call attention to the fact that the Conference for the Limitation of Armaments recently held in Washington may set a precedent for additional conferences, and that in the future the 5:5:3 ratio may be gradually extended to cover auxiliary naval vessels, strength of Army, and many other military features. It is, therefore, possible in considering military establishments, to assume that personnel, matériel, etc., of various governments are equal or at least comparatively equivalent when distances at which war may be waged are taken into account.

History in the past has shown that there has been competition existing between the various countries in the development of sizes and speeds of capital ships, armor protection, increased sizes and ranges of guns, etc. In view of the limitations of the Conference, and the possible limitations of other future conferences, how then will the competition between nations develop? It is only

possible to conjecture upon this question, but a reasonable guess would be that it would develop into a race for refinement of all sorts of material, the development of vastly superior matériel, and the improvement and increased efficiency of existing personnel.

In order to improve, develop, and refine matériel, it will be necessary for the officers in charge to receive additional specialized education. Then they will be able to co-operate with the various institutions of learning and the research organizations of large manufacturing companies throughout the land in order to encourage the development of the Navy's needs.

The improvement of personnel will have to be accomplished by detailing them to these same institutions and manufacturing establishments in order that they may become competent to realize the scope and difficulties of the particular problem confronting them, and co-ordinate efforts within the Navy with those outside the Navy. It may, therefore, be seen that personnel is indirectly involved if matériel is to be bettered and directly concerned where personnel is to be improved. There is nothing new or novel in either of these propositions and as may be observed from the resumés given above, it is being done today in a measure by both the War and Navy Departments. The present program, however, will have to be increased and intensified in the future.

Ultimately, however, one change will be made. It is as follows: Those duties now purely extraneous to the development of the line officer, and which in no way increase his efficiency for command afloat will eventually be eliminated from the character of duties assumed by him. Attention should be invited at this point to the paragraphs quoted above from the *Bureau of Navigation News Bulletin No. 20,* April 4, 1923, which might be taken as indicating that the limit of assimilation of the line officer had been reached in view of the fact that twenty per cent of officers fail on supervisory examinations. Finally the average amount of shore duty will probably be increased through the establishment of intensive courses of training for officers of every rank and every corps at the Naval War College, or civilian technical institutions, and instead of a comparatively few officers attending the Naval War College, as at present, there will probably develop a university which would correspond to a postgraduate school where

tactics, strategy, and perfection of the utility of naval weapons will be studied, and where research will be carried out.

In support of this belief, the following is offered. There are two reasons why enlisted men are kept in their special ratings throughout their service in the Navy. One is that their terms of enlistment are relatively short, and even at present too much time has to be spent in training them for their particular duties in proportion to the time spent in the performance of the same. The other reason takes into account the amount of education previously received by each enlisted man. In other words, the limit of assimilation of various tasks is quickly reached in enlisted personnel, but not so quickly in officer personnel. With the competition, however, in the future, it will be realized that the limits of individual assimilation of officer personnel have been reached, and if we are to have the most efficient Navy afloat, it will of necessity be a Navy of officers specially trained in their particular function, and continuing throughout their naval careers in that function.

It is, of course, realized that this intensive training of officer personnel may be carried to a harmful extreme, and result in making each officer ignorant of all activities in the Navy except his particular duties. His training, therefore, must include with it a proper perspective of the co-ordination of all naval activities. The proper co-ordination of activities is a matter of Navy Department organization, just as the proper co-ordination of the various arms in land warfare is dependent upon the General Staff evolving the plan of battle.

To put it concretely, given equivalent matériel, etc., a Navy of trained men can defeat a Navy of untrained men. This admits of no argument, and a reasonable corollary is that a Navy of functionally trained personnel can defeat a Navy whose personnel spend portions of their time in different functions some of which have little or no value in increasing the efficiency of the officer in his duty afloat.

Let us hope that it will not be necessary to have a war to demonstrate military inefficiencies and what should be done—but that improvements will take place in personnel through further education and training and in material through improved personnel.

THE "MONITOR" AT SEA AND IN BATTLE

By the Late Captain S. Dana Greene

Editor's Note: Personal narrative always exceeds in interest the dry pages of official record. In this letter to his mother, now for the first time published, we have the account by a young lieutenant, then only twenty-one years old, of the historic voyage of the *Monitor* from New York to Hampton Roads, and of her subsequent battle with the *Merrimac*, on March 9, 1862.

The writer of the letter was not only at an impressionable age, but in a position to observe and recount the facts of which he speaks. His story is the more interesting by reason of the fact that when the commanding officer became wounded he succeeded to the command of the *Monitor*.

The letter was submitted to the Institute by Captain N. J. Blackwood (MC) U. S. N., through the courtesy of Doctor Edward Emerson, of Concord, Mass., and is published with the permission of Mr. George DeB. Greene, Captain Greene's son. It was long a prized possession in the Greene family.

Some of the most fascinating accounts of historic events repose, long since forgotten, in the files of ancient correspondence. The Editor will be glad to receive for publication such of these as may, from time to time, be brought to light.

U. S. Steamer *Monitor*
Hampton Roads, March 14, 1862.

Dear Mother:

I commence this now, but I don't know when I shall finish, as I have to write it at odd moments, when I can find a few minutes' rest. When I bid Charley good night on Wednesday the fifth I confidently expected to see you the next day, as I then thought it would be impossible to finish our repairs on Thursday, but the Mechanics worked all night, and at 11 A. M. on Thursday we started down the Harbor, in company with the gunboats *Sachem* and *Currituck*. We went along very nicely, and when we arrived at Governor's Island, the Steamer *Seth Low* came alongside and took us in tow. We went out past the Narrows with a light wind from the West and very smooth water. The weather continued the same all Thursday night. I turned out at 6 o'clock on Friday morning, and from that time until Monday at 7 P. M. I think I lived ten good years. About noon the wind freshened and the

[Copyright: U. S. Naval Institute, Annapolis, Md.]

sea was rough. In the afternoon the sea was breaking over our decks at a great rate, and coming in our hawse pipe forward in perfect floods. Our berth deck hatch leaked in spite of all we could do, and the water came down under the tower like a waterfall. It would strike the pilot house and go over the tower in most beautiful curves. The water came through the narrow eyeholes in the pilot house with such force as to knock the helmsman completely round from the wheel. At 4 P. M. the water had gone down our smoke stacks and blowers to such an extent, that the blowers gave out and the engine room filled with gas. Then, Mother, occurred a scene I shall never forget. Our engineers behaved like heroes, every one of them. They fought with the gas endeavoring to get the blowers to work until they dropped down as apparently dead as men ever were.

I jumped in the engine room with my men as soon as I could and carried them on top of the tower to get fresh air. I was nearly suffocated with the gas myself, but got on deck after everyone was out of the engine room, just in time to save myself. Three firemen were in the same condition as the engineers. Then things looked rather blue.

We had no fear as long as the engine could be kept going to pump out the water, but when that stopped, the water increased rapidly. I immediately rigged the hand pump on the berth deck, but as we were obliged to lead the hose out over the tower, there was not force enough in the pump to throw the water out.

Our only resource now was to bail, and that was useless as we had to pass the buckets up through the tower, which made it a very long operation. What to do now we did not know, we had done all in our power, and must let things take their own course.

Fortunately the wind was off shore, so we hailed the tug boat and told them to steer directly for the shore, in order to get in smooth water. At 8 P. M. we managed to get the engines to go, and everybody comparatively quiet again.

The Captain had been up nearly all the previous night, and as we did not like to leave the deck without one of us being there, I told him I would keep the watch from 8 to 12, he take it from 12 to 4, and I would relieve him from 4 to 8. Well, the first watch passed off very nicely, smooth sea, clear sky, and the moon out and the old tank going along 5 and 6 knots very nicely. All I had to

do was to keep awake, and think over the narrow escape we had had in the afternoon. At 12 o'clock things looked so favorable that I told the Captain he need not turn out, I would lie down with my clothes on, and if anything happened I would turn out and attend to it. He said "very well" and I went to my room and hoped to get a little nap. I had scarcely got to my bunk when I was startled by the most infernal noise I ever heard in my life. The *Merrimac's* firing on Sunday was music to it. We were just passing a shoal, and the sea suddenly became rough and right ahead. It came up with tremendous force, through our anchor well, and forced the air through our hawse pipe where the chain comes, and then the water would come through in a perfect stream, clear to our berth deck, over the ward-room table. The noise resembled the death groans of twenty men, and was certainly the most dismal awful sound I ever heard. Of course the Captain and myself were on our feet in a moment and endeavoring to stop the hawse pipe. We succeeded partially, but now the water began to come down our blowers again and we feared the same accident that happened in the afternoon. We tried to hail the Tug boat, but the wind being dead ahead they could not hear us and we had no way of signaling them, as the steam whistle which Father recommended had not been put on. We began to think then the *Monitor* would never see daylight. We watched carefully every drop of water that went down the blowers, and sent continually to ask the firemen how the blowers were going. The only answer was "slowly," but could not be kept going much longer, unless we could stop the water from coming down. The sea was washing completely over our decks, and it was dangerous for a man to go on them, so we could do nothing to the blowers. In the midst of all this our wheel ropes jumped off the steering wheel (owing to the pitching of the ship) and became jammed. We now began to sheer about at an awful rate and we thought our hawser must certainly part. Fortunately it was a new one and held on well. In the course of half an hour we fixed our wheel ropes and now our blowers were the only difficulty. About 3 o'clock on Saturday morning, the sea became a little smoother, though still rough, and the water going down our blowers to some extent. The never-failing answer from the engine-room, "Blowers going slowly but can't hold out much longer." From 4 A. M. till daylight was cer-

tainly the longest hour and a half I ever spent. I certainly thought old Sol had stopped in China, and never intended to pay us another visit. At last, however, we could see, and made the Tug boat understand to go nearer in shore and get in smooth water, which we did at about 8 A. M. Things again were a little quiet, but everything wet and uncomfortable below. The decks and airports leaked, and the water still came down the hatches, and under the tower. I was busy all day making out my station bills, and attending to different things that constantly required my attention.

At 3 P. M. we parted our hawser, but fortunately it was quite smooth, and we secured it without difficulty. At 4 P. M. we passed Cape Henry and heard heavy firing in the direction of Fortress Monroe; as we approached it increased and we immediately cleared ship for action. When about half way between Fortress Monroe and Cape Henry we spoke a pilot boat. He told us the *Cumberland* was sunk, and the *Congress* was on fire, and surrendered to the *Merrimac*. We did not credit it at first, but as we approached Hampton Roads we could see the fine old *Congress* burning brightly, and we knew then it must be so. Sadly indeed did we feel, to think those two fine old vessels had gone to their last homes, with so many of their brave crews. Our hearts were very full, and we vowed vengeance to the *Merrimac*, if it should ever be our lot to fall in with her. At 9 P. M. we anchored near the frigate *Roanoke*, the Flagship, Captain Marston (the major's brother); Captain Worden immediately went on board and received orders to proceed to Newport News, and protect the *Minnesota* (which was aground) from the *Merrimac*. We got under way and reached the *Minnesota* at 11 P. M. I went on board in our cutter and asked the Captain what his prospects were of getting off. He said he should try to get afloat at 2 A. M. when it was high water. I asked him if we could render him any assistance, to which he replied, "no." I then told him we should do all in our power to protect him from the attack of the *Merrimac*. He thanked me kindly and wished us success. Just as I got back to the *Monitor*, the *Congress* blew up, and certainly a grander sight was never seen, but it went straight to the very marrow of my bones. Not a word was said but deep did each man think and wish he was by the side of the *Merrimac*. At 1 A. M. we anchored

near the *Minnesota*. The Captain and myself remained on deck, waiting for the *Merrimac*. At 3 A. M. we thought the *Minnesota* was afloat, and coming down to us, so we got under way as soon as possible, and stood out of the Channel. After backing and filling about for an hour, we found we were mistaken and anchored again. At daylight, we discovered the *Merrimac* at anchor with several other vessels under Sewall's Point. We immediately made every preparation for battle. At 8 A. M. on Sunday the *Merrimac* got under way, accompanied by several steamers, and started direct shots at the *Minnesota*. When a mile distant she fired two shots at the *Minnesota*. By this time our anchor was up, our men at quarters, and everything ready for action. As the *Merrimac* came down, the Captain passed the word to commence firing; I triced up the port, ran out the gun and fired the first gun, thus began the great battle between the *Merrimac* and *Monitor*.

Now mark the condition our men and officers were in; since Friday morning, forty-eight hours, they had had no rest, and very little food as we could not conveniently cook. They had been hard at work all night, had nothing to eat for breakfast except hard bread, and were thoroughly worn out. As for myself, I had not slept a wink for fifty-one hours, and had been on my feet almost constantly. But after the first gun was fired, we forgot all fatigue, hard work and everything else, and went to work fighting as hard as men ever fought. We loaded and fired as fast as we could, I pointed and fired the guns myself. Every shot I would ask the Captain the effect, and the majority of them were encouraging. The Captain was in the pilot house directing the movements of the vessel. Acting Master Stodder was at the wheel which turns the tower, but as he could not manage it he was relieved by Stenners. The speaking trumpet from the tower to the pilot house was broken, so we passed the word from the Captain to myself on the berth deck, by Paymaster Keeler and Captain's Clerk Toffy. Five times during the engagement we touched each other, and each time I fired a gun at her, and I will vouch that the 168 lbs. penetrated her sides. Once she tried to run us down with her iron prow, but did no damage. After fighting for two hours we hauled off for half an hour to hoist our shot in the tower. At it we went again as hard as we could. The shot,

shell, grape, canister, musket and rifle balls flew about us in every direction, but did us no damage. Our tower was struck several times and though the noise was pretty loud, it did not affect us any. Stodder and one of the men were carelessly leaning against the tower, when a shot struck it exactly opposite to them, and disabled them for an hour or two. At about 11:30 the Captain sent for me, I went forward, and there stood as noble a man as ever lived, at the foot of the ladder of the pilot house. His face was perfectly black with powder and iron, and he was apparently perfectly blind. I asked him what was the matter. He said a shot had struck the pilot house exactly opposite his eyes, blinded him, and he thought the pilot house was damaged. He told me to take charge of the ship and use my own discretion. I led him to his room, laid him on the sofa, and then took his position. On examining the pilot house I found the iron hatch on top had been knocked about half way off, and the second iron log from the top on the forward side was completely cracked through. We still continued firing, the tower being under the direction of Stenners. We were between two fires. The *Minnesota* had struck in twice on the tower, and the *Merrimac* was retreating to Sewall's Point. I knew if another shot should strike our pilot house in the same place, our steering apparatus would be disabled, and we would be at the mercy of the Batteries on Sewall's Point. The *Merrimac* was retreating toward the latter place. We had strict orders to act on the defensive and protect the *Minnesota*. We had evidently finished the *Merrimac* as far as the *Minnesota* was concerned. Our pilot house was damaged and we had strict orders not to follow the *Merrimac*, therefore after the *Merrimac* had retreated I went to the *Minnesota* and remained by her until she was afloat.

General Wool and Secretary Fox have both complimented me very highly for acting as I did, and said it was the strict military plan to follow. This is the reason we did not sink the *Merrimac*, and everyone here capable of judging says we acted exactly right.

The fight was over now, and we were victorious. My men and myself were perfectly black with smoke and powder. All my underclothes were perfectly black and my person was in the same condition. As we ran alongside the *Minnesota*, Secretary Fox hailed us and told us we had fought the greatest naval battle

on record, and behaved as gallantly as men could. He saw the whole fight. I felt proud and happy then, Mother, and felt fully repaid for all I had suffered. When our noble Captain heard the *Merrimac* had retreated, he said he was perfectly happy and willing to die, since he had saved the *Minnesota*.

Ah, how I love and venerate that man! Most fortunately for him, his friend and classmate, Lieutenant Wise saw the fight and was alongside directly after the engagement. He took him on board the Baltimore boat, and carried him to Washington that night.

The *Minnesota* was still aground, and we stood by her till she floated at 4 P. M. She grounded again shortly and we anchored for the night. I was now Captain and First Lieutenant and had not a soul to help me on the ship, as Stodder was injured, and Webber useless. I had been up so long, had had so little rest, and been under such a state of excitement, that my nervous system was completely run down. Every bone in my body ached, my limbs and joints were so sore I could not stand, my nerves and muscles twitched as though electric shocks were continually passing through them, and my head ached as if it would burst. Sometimes I thought my brain would come out over my eyebrows. I lay down and tried to sleep, I might as well have tried to fly. About 12 o'clock, Acting Lieutenant Flye came on board and reported to me for duty. He lives in Topsham, opposite Brunswick, and recollects Father very well. He immediately assumed the duties of First Lieutenant and I felt considerably relieved. But no sleep did I get that night, owing to my excitement. The next morning at 8 o'clock, we got under way and stood through our fleet. Cheer after cheer went up from the Frigates and small craft, for the glorious little *Monitor,* and happy indeed did we all feel. I was Captain then of the vessel that had saved Newport News, Hampton Roads, Fortress Monroe (as General Wool himself said) and perhaps your Northern ports. I am unable to express the happiness and joy I feel to think I had served my country and my flag so well, at such an important time. I passed Farquhar's vessel and answered his welcome salute. About 10 A. M. General Wool and Mr. Fox came on board and congratulated us on our victory, etc. We have a standing invitation to dine with General Wool, but no officer is allowed to leave the ship until we sink the

Merrimac. At 8 o'clock that night, Tom Selfridge came on board and took command and brought me the following letter from Mr. Fox.

"U. S. Steamer *Roanoke*,
Old Point, March 10, 1862.

"*Dear Mr. Greene:*

"Under the extraordinary circumstances of the contest yesterday, and the responsibility devolving upon one of your extreme youth, I have suggested to Captain Marston, to send on board the *Monitor* as temporary Commander, Lieutenant Selfridge, until the arrival of Commodore Goldsborough, which will be in a few days. I appreciate your position and you must appreciate mine, and serve with the same zeal and fidelity.

"With kindest wishes for you all.

"Most truly,
"G. V. Fox."

Of course I was a little taken back at first, but on a second thought, I saw it was as it should be. You must recollect the immense responsibility resting on this little vessel. We literally hold all the property ashore and afloat in these regions, as the wooden vessels are useless against the *Merrimac*. At no time during the war has any one position been so important as this vessel. You may perhaps think I am exaggerating somewhat because I am in the *Monitor*, but the President, Secretary and General Wool all think so, and have telegraphed to that effect, for us to be vigilant, etc. The Captain receives every day, numbers of anonymous letters from all parts of the country, suggesting plots to him. And I think some people north of Mason and Dixon's line have a *little* fear of the *Merrimac*. Under these circumstances, it was perfectly right and proper in Mr. Fox to relieve me of the command, for you must recollect I had never performed any but midshipman's duty until this time, but between you and me, I would have kept the command with all its responsibility if I had my choice, and either the *Merrimac* or the *Monitor* should have gone down in the next engagement. But then you know all young people are vain, conceited and without

judgment. Even the President telegraphed to Mr. Fox to do so and so, Mr. President, I suppose thinking Mr. Fox rather young, he being only about forty. Mr. Fox, however, had already done what the President telegraphed to him several hours before. Selfridge was only in command two days until Lieutenant Jeffers arrived from Roanoke Island.

Mr. Jeffers is everything desirable, talented, energetic, educated and experienced in battle. Well, I believe, I have about finished. Butts, my old roommate, was on board the *Merrimac*—little did we ever think at the Academy, we should ever be firing 150 lb. shot at each other, but so goes the world. Our pilot house is nearly completed. We have now solid oak extending three inches below the eyeholes in the pilot house to five feet out on the deck. This makes an angle of twenty-seven degrees from the horizontal. This is to be covered with three inches of iron. It looks exactly like a pyramid. She will now be invulnerable at every point. The deepest indentation on our sides was four inches. Tower two inches and deck one-half inch. We were not at all damaged except the pilot house. No one was affected by the concussion in the tower, either by our own guns or by the shot of the enemy.

This is a pretty long letter for me for you recollect my writing abilities.

With much love to all.

Your affectionate son,

(Signed) S. D. GREENE.

THE NAVY AT THE BATTLES OF TRENTON AND PRINCETON

By Major Edwin N. McClellan, U. S. Marine Corps

THERE has been, as yet, no adequate recognition of the assistance rendered by the Navy, in the land campaigns of the Revolution; yet the successes of those campaigns were in no small part due to the Navy's work. Where can you read of the gallant and invaluable assistance that the Navy afforded the Army at the Battles of Trenton and Princeton, and during those gloomy and almost hopeless days prior to these battles of our Revolution?

Every school child is familiar with the inspiring story of how Washington in 1776—defeated in the battles around New York—retired across the Jerseys with the enemy in confident pursuit; how—after receiving large reinforcements from Philadelphia—he recrossed the ice-jammed river through a blinding snow storm, and captured Rall's Hessians at Trenton; how he returned to the Pennsylvania side, and thence once more recrossing to the Jerseys, won the Battle of Princeton on January 3, 1777; but that is only half the story.

It was not by accident that Washington's Army found transportation waiting for it about December 8, when, gasping and depleted, it reached the Delaware; that the British fleet was not in the Delaware waiting for Washington's arrival; or that the British Army was forced to halt at the river bank, for want of boats. It was not the aroused citizens alone that furnished all the reinforcements received by Washington; it was no group of undisciplined men unused to the water that made possible the crossings of the Delaware. It was in these, and other respects, that the Navy gave its effective co-operation; it was thus that it made possible the victories that were so vital to Washington's campaign.

One of the main objects of that part of the Continental Navy which lay in the Delaware and of the Pennsylvania Navy was the

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protection of Philadelphia, the seat of the Continental Government. J. Fenimore Cooper in his *History of the Navy* wrote that "Philadelphia being the seat of government, the largest town in the country, and naturally strong in its defenses, more than usual attention was paid to the means of preventing the enemy from getting possession of it by water." British vessels maintained a close watch at the mouth of the Delaware Bay and in 1776, as well as in other years, they menaced the Capital City, hoping to form a junction with their army on the Delaware. They found the way barred by armed ships of Pennsylvania and the Continental Congress. For instance, in May of that year the Continental ship *Reprisal* (Captain Lambert Wickes) and the Pennsylvania ships *Montgomery*, *Aetna*, and thirteen other armed boats engaged the *Roebuck* and *Liverpool* in the lower Delaware near the mouth of the Christiana. The Continental schooner *Wasp* (Captain Charles Alexander) at the same time captured an enemy brig. There is no question but that this part of the Navy's mission was efficiently accomplished.

Now let us consider the situation as it was during Washington's retreat after his defeat around New York. The whole of the Jerseys was overrun by the enemy, and Congress, after making Washington dictator, had retired to Baltimore. While Washington was thus retreating—just managing to keep ahead of the British—the vessels of the Continental and Pennsylvania Navies with a large number of boats and barges combed the banks of the river, above and below Trenton, gathering in everything that would float.

At this time there were in the river several vessels of the Continental Navy. Among them were the frigate *Delaware* (Captain Charles Alexander), the frigate *Randolph* (Captain Nicholas Biddle), the *Andrea Doria* (Captain Isaiah Robinson), and the sloop *Hornet;* while the frigate *Washington*, under the command of Captain Thomas Read, and the frigate *Effingham*, commanded by Captain John Barry, were on the stocks unfinished. The Pennsylvania State Navy also had a large number of ships, and their mission and achievements were as national in character as those of the Continental Navy, except that they were, in general, confined to the limits of the Delaware Bay and river. In the early

autumn of 1776 there were 768 bluejackets and marines, with a corresponding number of officers, serving on board twenty-eight Pennsylvania vessels.

Washington's army completed the passage of the river on December 8. So effective had been the work of the Navy, however, that when the British reached the river shortly after, not a boat was to be found, and their generals quickly decided that it would be impossible to cross until the river should freeze. Accordingly the British occupied Trenton, and spread up and down the eastern bank of the Delaware occupying towns and strong positions.

After crossing the river, Washington called for men and planned for the defense of Philadelphia. Of the reinforcements sent in answer to his urgent requests, a large number were bluejackets and marines. Some joined him in time to fight at Trenton, while others did not arrive until a few days before the Battle of Princeton.

The commanding officer of the frigate *George Washington,* Captain Thomas Read, volunteered for land service and, on December 2, was directed to join General Washington, with his officers, bluejackets and marines. They were assigned to the artillery. Captain John Barry, commanding the unfinished Continental frigate *Effingham,* also joined, but his biographers have so confused the facts in their praises of his services that it is difficult to set forth his achievements. In addition, Captain James Nicholson, in command of the Continental frigate *Virginia,* under construction at Baltimore, and Captain George Cook, commanding the Maryland ship *Defence,* hastened north with their seamen and marines. The marines of the *Andrea Doria,* under Captain Isaac Craig, were also among the reinforcements. Then there was the splendid battalion of marines commanded by Major Samuel Nicholas, in whose memory a destroyer of the United States Navy has been named. This battalion reported to Washington in the Jerseys in November of 1776.

The Pennsylvania Navy furnished a number of officers and men to Washington's army. Among them were the fifty marines of the flagship *Montgomery* under Captain William Brown and First Lieutenant James Morrison, serving as artillery; and Captain

William Shippin and his thirty marines of the *Hancock,* serving as infantry. The marines and other enlisted men of the *Arnold Battery* under Captain Thomas Forrest also joined, while from correspondence it would appear that all or part of the crew of the *Putnam Battery* were present. So much for the naval forces that reinforced the Army ashore.

From December 8 to the date of the Battle of Trenton, the Navy was the military eyes of Washington through which he kept watch of the enemy on the opposite shore. The efficient aid afforded by the *Hancock* and other vessels off Burlington, in the latter half of December, illustrates how well the Navy occupied the "front line trenches" during this eventful period. The Hessians entered Burlington on December 11. The *Hancock* and other vessels present immediately opened fire on the town. The next day Captain Moore of the *Hancock* sent Captain William Shippin and his thirty marines ashore with orders to burn the town if he found Hessians there. Finding that the Hessians had withdrawn the day before, Captain Shippin spent a few days securing information and then returned to his ship on the 17th.

Not only did the Navy maintain a close observation of the enemy's movements, but it was prepared to contest his passing the river. On December 12, the frigate *Randolph* and the sloop *Hornet* of the Continental Navy were "put under the direction of the Continental General commanding in Philadelphia, to act as he shall direct, for the defense of the city," and "preventing the enemy from passing the Delaware." The above described incident at Burlington and the Navy's readiness to defend the Delaware against any effort of the enemy to cross are illustrative of the importance of the part played by the Navy. It had not only saved Washington's army, but, through the control of the Delaware, finally forced the enemy to abandon his attempts to capture Philadelphia from the north.

As soon as Washington had received sufficient men and matériel. he began a retaliatory offensive. His first plan was for the capture of Rall's Hessians at Trenton. He divided his forces into three divisions. Washington, with about 2,400, decided to cross the Delaware at McKonkey's Ferry (now Taylorsville) a few miles above Trenton; General Cadwalader was to cross at

Bristol; and General Ewing at Trenton Ferry. Only Washington's division succeeded in getting to the Jersey shore. The Pennsylvania archives state that "in December when the British army threatened Philadelphia, the armed boats lent efficient service in transporting General Washington's army across the Delaware." The value of the services rendered by the Navy at this time cannot be overestimated.

It was 3:00 A. M., December 26, before all of Washington's division got over the river. General Ewing failed to cross at Trenton Ferry and General Cadwalader did not succeed in getting over at Bristol, though he "got part of his foot over."

The Navy was well represented ashore at the first Battle of Trenton on December 26. We know that the detachment of the *Washington's* bluejackets under Captain Thomas Read received special commendation for their part in this battle. Scharf, in his *History of Delaware,* writes that after giving "valuable assistance in the celebrated crossing of the Delaware," Captain Read "commanded a battery composed of guns taken from his own frigate," the *Washington,* "which raked the stone bridge across the Assanpink," and that for "this important service he received the thanks of all the general officers." Barry's biographers say that Barry was there. Cooper says Captain Nicholson and his bluejackets and marines of the *Virginia* were there. The Society of the Sons of the American Revolution of Pennsylvania says Captain Shippin and his marines of the Pennsylvania ship *Hancock* were there. The *Magazine of History* says Captain William Brown and his marines of the *Montgomery* were there. All authorities show Captain Thomas Forrest was there, while General Wilkinson, in his *Memoirs,* states that Forrest commanded artillery "under the immediate eye of General Washington." How many more were present we do not yet know.

Washington returned to the Pennsylvania side the evening of the 26th, taking with him his prisoners and captured artillery.

General Cadwalader's division crossed over to Jersey on the 27th at Minnick's Ferry, about a mile above Bristol. The Navy again rendered valuable assistance in ferrying it across, the Marylanders in particular, under Captains James Nicholson and George Cook, performing excellent service. General Cadwalader pro-

ceeded to Burlington where he was joined by "a detachment of sailors used to firing guns," under command of Captain Thomas Read of the Continental Navy and other naval forces under Major Nicholas, Captains Isaac Craig, William Shippin, Willam Brown and others. General Cadwalader then pushed on to Bordentown, where he arrived on the 29th.

General Washington recrossed the river on the same date—the Navy once more assisting—and occupied Trenton. Here General Cadwalader and General Mifflin with their divisions joined him, on New Year's Day, 1777. The enemy advanced toward Trenton from Princeton on the 2d and, after a small but important engagement with them, Washington retired across the Assanpink, a creek which runs through Trenton.

How well Washington extricated himself from this perilous position and won the Battle of Princeton on January 3, 1777, is well known. At any rate all the naval forces mentioned above as being ashore did a gallant share of the fighting, suffered losses and were highly commended. Captain William Shippin of the Pennsylvania marines was killed. If our authorities are not all wrong, there were present at this battle some officers and some or all of the crews of each of the Continental ships of war, *Effingham, Virginia, Washington, Delaware,* and *Andrea Doria;* a battalion of Continental marines under Major Samuel Nicholas; some of the officers and part of the crews of the flagship *Montgomery* and the *Hancock;* and the marines and others of the floating batteries *Arnold* and *Putnam* of the Pennsylvania Navy. Of these, the detachments under Captains Read, Brown and Forrest, served as artillery. No doubt many more officers and men of the Pennsylvania Navy, of whose services no record has yet been found, were also present. The potential assistance of the Pennsylvania Navy, including marines, about this time, was seventy-three commissioned officers, 123 noncommissioned officers and 513 enlisted men, a total of 709.

At the conclusion of these operations, the naval personnel, with the exception of the detachments under Major Nicholas and Captains Forrest and Brown, resumed their former stations and duties. Captain Forrest joined the artillery of Washington's army. Captain Brown's company left the Army on January 23d,

while the battalion of Major Nicholas accompanied Washington to Morristown and served with the Army for several months before returning to duty with the Navy.

The total number of bluejackets and marines serving with the Army at the Battles of Trenton and Princeton is nowhere stated. That there were at least 500 officers, bluejackets and marines ashore with Washington, and as many more on the co-operating vessels, is certain. Out of a total force of only a few thousand, this was no inconsiderable proportion.

Tedious and painstaking research will some day reveal far more than is told in these pages; but sufficient will be read here to indicate that without the assistance afforded by the Continental Navy and Navies of Pennsylvania and Maryland, the victories of Trenton and Princeton would never have been won.

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ON THE ORIGIN OF WAR

By Lieutenant P. J. Searles (CEC), U. S. Navy

IS WAR inevitable? Can war in the sense of ordered, organized, conscious conflict of human beings be wiped out of existence, or must the future bring the same catastrophes that have afflicted the human race in the past? Today when the world is suffering from the greatest disaster in history, when civilization is on the brink of ruin because of the hatreds of men, it is necessary to consider whether war is inevitable and must remain, or whether in response to the cries of the pacifist, idealist, and the suffering people, it can be swept from the earth. Based largely upon his reaction from the past war, Arthur Balfour has said that "history is a discreditable episode in the life of one of the meaner planets." Before accepting this despairing cry, it would be well to examine thoroughly the causes of war in an attempt to determine whether they are the fault of human frailty or wickedness, or whether there is not an underlying reality that forces conflict upon man.

What is behind the long series of struggles, and what can be done to remove the basis? The exact causes of fighting among prehistoric men cannot be known, but can be approximated by considering the causes among savages of the past and of today. While not all these causes may have been present among the men of the Stone age, and while other causes, now nonexistent, may have been in operation, still there is a general analogy which may be used for analysis.

Paradoxical as it may seem, the first cause of conflict was the instinct of self-preservation. Man, newly risen to a certain degree of intelligence, was still partially conscious (or subconscious) of jungle days, and was suspicious of his own kind and of other forms of life. The struggle of his ancestors remained in his memory, and it required only a modicum of atavism to throw him back to a struggle with tooth, claw or stone hatchet for the defense of his life. Each life was a potential enemy, the

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tiger, the snake, the wolf, and not least, man himself. Generosity, selflessness, brotherly love and similar virtues were still to be born, and man had not arrived at the stage where he could show trust. Battle had been the law of the jungle, and battle remained the law of man.

Intimately connected with the mutual suspicion of other men, was envy, jealousy, and desire. Certain individuals, families, or tribes had by peaceful settlement or otherwise, acquired desirable hunting grounds, pastures, or dwelling places. The less fortunate, not yet cognizant of the more modern idea of the sacredness of property rights, attempted to dispossess the occupants. The latter offered a natural objection and conflict ensued. The urge on the part of the aggressors may have been a desire for a warm, comfortable cave, it may have been a realization that the victims held control of land where hunting was easy or pasturage ample for the simple herds; it may have been a desire to escape from climatic rigors, or it may have been a predatory desire for the tools, women, herds or what not of those more fortunately placed. But whatever the immediate reason, the ultimate cause lay in desire based on the instinct of self-preservation, best satisfied when protection against hunger, cold or aggression could be secured. Of course there were minor causes, such as retaliation for an unsuccessful attempt at dispossession, revenge for an insult, natural combative instincts on the part of some, attempts to uphold the authority of tribal gods, etc., but these also could be traced to self-preservation if space permitted.

These primal urges existed for thousands of years down to the dawn of history, but at the time when more or less accurate records begin, they have been elaborated and complicated to a considerable extent. Let us consider the earlier civilizations, those of Assyria and Egypt for example. These were of what is known as the God-King type of monarchies. The rulers combined god-like and king-like functions, and in at least the popular mind (and perhaps originally in all minds) were divinely related and upon demise took their seat in the national pantheon. Surrounding the ruler was an aristocratic group, sometimes humanly endowed, sometimes semi-divine, who were representatives of the king, thoroughly subservient to his personal leadership, but also as thoroughly superior to the rest of the population. Grouped

behind the throne were the military leaders, generals of the armies, superior beings who guided the destinies of the nations and created history. The base of the structure was composed of the mass of the people, traders, merchants, bankers, laborers, partly free, partly enslaved, but all debased and inferior in the eyes of the higher ranks. There also existed a class apart who occupied a powerful but precarious position individually—the priests. Their function, like the function of the priesthood of today, was to direct the worship of the gods, keep the temples, occasionally collect taxes, and to guide not so much the moral as the religious life of the people. Now what causes of war could exist in such nations?

First and most important is the old instinct for self-preservation, what might be called the "maintenance and increase of material welfare," or what might, to put it baldly, be called robbery. Each nation was struggling for existence. Starting with a city, the people had extended their influence to the surrounding country, expanding more and more, and with each acquisition becoming more acquisitive. In time came interference with other people similarly expanding, and this interference caused conflict. Perhaps the two desired the same fertile pasture or orchard, perhaps they desired the same river with its transportation and irrigation facilities, or perhaps both peoples sought suzerainty over the same helpless weak tribe for the sake of tribute. But it was all robbery of the weak by the strong. Assyria did not fight Babylon primarily because one wished to impose its gods on the other. Egypt did not invade Mesopotamia because of the urge for aggrandizement on the part of Pharaohs, the Sumerians and Akkadians did not engage only for the joy of fighting. These elements were present, they added their weight to aggression, but behind it all was selfish acquisitiveness, robbery. Each wanted what the other possessed, and each was willing to risk its own to acquire that of others. What originally may have been a war for subsistence caused by a bad agricultural season or the perishing of herds, tended in time to become a war of plunder because fighting brought greater returns than work. This led to the establishment of a fighting class, what might be called the professional militarists, men who partially plundered for their own gain or were employed by the rulers for the same

end. But no matter how carried on or by whom, it was robbery pure and simple.

In succeeding times came a change in the form of government in much of the ancient world. The older states still retained their God Kings, to some extent, but new states arose, city states such as Greece and Rome, nominally republics, but actually ruled by oligarchies. Citizenship was limited to a few of the population and power was in the hands of a small group, partly hereditary and partly ephemeral, but always aristocratic, wealthy and overbearing. The mass of the population consisted of traders, artisans, freedmen and slaves, and above all, of soldiers Priesthood still existed, wealthy and influential, ever ready to prophesy success in arms, and ever ready to accept reward for victory. The limits of the states varied, and the thought of one state was alien to that of another, but war remained the same.

Greece was divided into numerous small states of a few square miles each, intensely jealous and suspicious of each other. Her political history is comprised in constant warfare which led to the submission or reduction of city after city, culminating in complete domination by Macedon and Rome. Each city attempted to expand, and in doing so ran counter to the ambitions of her neighbors. Each wanted something the other possessed, and each fought to acquire it. Every man was a potential if not an actual soldier, and every man was activated by the same motive of robbery, overlaid with a veneer called pride, city interests, etc.

With Rome the situation was somewhat different. She, under the influence of the aristocrats, men desirous of governorships of rich provinces, profiteers, the populace calling for free grain, the priests eager for temple adornments, traders who wished to scour the world for profit, and later under the urge of the military party, pursued a course of conquest which ultimately brought world rule. Let any nation have desirable possessions and Rome was knocking at her door, not with the peaceful hand of the merchant but with the mailed fist of the soldier. Greece had art treasures, Phoenicia had purple dyes, Britain had tin, and all fell before the conqueror. Egypt sent Rome 200,000 bushels of grain annually, and when payment was demanded, it was given with the sword. Carthaginian ships plowed the seas, but were swept off by Roman galleys permitting no rivals. Plunder was

the urge, by plunder Rome rose to power, and for plunder she fell before the invading hordes from the North. Not idealism, not self-determination, not morality, but robbery formed the basis of the history of the mistress of the world. What Rome desired she took.

For centuries after the fall of Rome anarchy prevailed, followed by the but slightly improved condition of new city states. Some of the states were large, some small, some weak, some powerful, some democratic, some aristocratic, but all were impelled to war by the same old cause. Machiavelli's *History of Florence* gives a true picture of medieval conditions, borne out by Cellini and numerous others who have left their memoirs. Whether Florence attacked Pisa, Paris defended herself against Burgundy, or whether Foix and Toulouse combined against Barcelona, the cause and the result were the same. The professional soldier arose, sometimes a troop owing allegiance to its feudal lord, sometimes a body trained to defend its home city, but usually a band of mercenaries held together by a Giovanni del Banda Nera and hired by the contesting rulers. They swarmed over Europe fighting, plundering, and pillaging until the continent was almost in ruins. The soldier gained a quick return in the form of loot, the ruler a somewhat slower return in the form of tribute, control of trade routes, etc. Few for ideals. Policy was decided by rulers, and the common people, ground beneath the heel of tyranny, could only live and die as beasts, their few revolts being crushed with ruthless severity.

Gradually out of the welter and turmoil of Europe rose a few states more powerful than the rest, France, Spain, Austria and the like. Ruled by a king, divinely appointed, controlled by aristocratic cliques too often through the influence of royal mistresses, and everywhere bound in the iron chains of war, conditions remained the same. In place of petty city conflicts, there came the mighty clash of nations, no longer Venice against Genoa, but France against Spain with an iron tread over Europe. France and Germany contested for that illusion, the Holy Roman Empire, France and Spain for the rule of Austria, England and Spain for the rule of the seas. The great states were constantly at war, and always ready for war. Deeply concerned in the course of events, seeking to direct and guide the destinies of

nations was a new class that arose, at first as champions of the people but later as their oppressors, the so-called statesmen or diplomats. Originally called into being by the masses to act as more or less responsible advisers to the king, they fell under the sway of the aristocracy, the offices became the football of politics, until finally the ministers were too often more eager than the king for national aggrandizement. Their seeds were secrecy, guile and trickery, the flowers of their policy were alliance and balance of power, dynasty and privilege, and the fruit was war. Again robbery was the motive, disguised under current shibboleths, but robbery at the bottom.

Down to the present day the great powers have held sway. Constitutional monarchy, republic, autocracy—the course has been the same. Let us examine a little more closely the causes of some of the wars of the past few centuries, inquire into the real basis, and attempt to determine how much knowledge can be applied to the future.

We can at once distinguish one class of wars which seem to be outside the common run of conflict for spoils. These are the struggles for liberty. Surely it can be no robbery to recover your homeland from the usurper, protect your country from the invader. Spain after years of subjection drove the Moors from their land. The Dutch fought desperately and even attempted national suicide in defense of their liberty. The United States spent six years in revolution, because the rights of certain Englishmen were being trampled on by a Hanoverian King ruling over Englishmen. For half a century South America struggled against the oppressive rule of Spain and finally became free. Where is the robbery in these wars? The robbery lies not in the fight of the oppressed, but in the attempt on the part of one state to perpetuate an old robbery of another. Before each war for freedom, there was of necessity a war of acquisition, the consequences of the latter leading to the former.

Too often, however, the liberated state in turn became an oppressor. Spain, after freeing herself from the domination of the Moors, attempted to spread her rule throughout Europe; Austria and Netherlands being the especial sufferers. She also reached out to the New World and for centuries was a thorough exponent of tyranny. But behold, no sooner did Argentina, Peru,

Uruguay and other South American countries secure their freedom than each in turn sought to plunder and enslave its neighbors. Nor is the United States without reproach, for how many Americans can view the treatment of the Indians or the Mexican War with pride. No country has a spotless toga.

Religious wars, fortunately almost extinct today, raged for centuries. The aggressor may have been Catholic Spain under the influence of the Inquisition, Cromwellian England, France under the League, or Sweden under the "Lion of the North." The ostensible reason for fighting was a desire to impose a certain religion upon a certain people, and this may have been the honest reason for a few fanatics, but was it the real impelling motive? No. Back of the crusading was a desire for acquisition, not a wish to give the benefits of any particular religion to another nation, but a desire to receive tribute in some form from that nation. The tribute may have been the throne of a country, an alliance, actual cash or what not, but there was always the acquisitive impulse to reap without sowing. Charles of Spain wanted not only spiritual suzerainty over the Low Countries, but also temporal overlordship, and he fought to secure it.

Another outward reason for war is the desire to secure a strategic frontier, a safe boundary. If all nations could be secure within impregnable bounds, if successful attack were impossible, then this reason might be justified in order to secure the desired end of safety. Russia pushed over eastward, England flung her flag around the world, the United States acquired a succession of islands in the Caribbean and in the Pacific, all in order to be safe from attack. Russia after innumerable contests with Tartars, Cossacks, Mongols and others, finally reached Korea, and then came in conflict with Japan also seeking to find safety in mainland frontiers. War resulted as was predicted for years. England has fought over the face of the earth, securing the Khyber Pass against Russia, Suez against everyone, guarding her communications, pushing her frontier farther and farther, each strategic point being but a jumping off place for the next attack. And each advance carried with it the potential and frequently the actual danger of conflict with another nation seeking to protect itself. The search for safe boundaries has led to war, not to peace. The United States has been safe so far, but Utopia

is not yet at hand. What is behind this constant pushing but the desire to secure something belonging to another. The very act presupposes a desire of one nation to absorb part of another or to protect herself against similar aggression. In either case one nation is robbing or attempting to rob another.

Civilizing the backward races can be dismissed shortly as it is so obviously due to the acquisitive spirit. It, of course, should be borne in mind that from the standpoint of the aggressor, acquisition may be just and conducive to the welfare of both sides of the dispute. But how seldom does the victim acquiesce in such opinion? Very few have been the cases, in which such acts have not been vigorously resisted, and in which a sore spot has not long after existed. Perhaps England has forwarded the cause of civilization in India, perhaps the United States is aiding Porto Rico, perhaps Japan is performing invaluable services in Manchuria, but what is the opposite view? The recipients of benefits showered upon them by beneficent nations are usually ungrateful, and their persistent belligerent attitude shrieks out "Robbery." What appears generosity to one is injustice to another.

A desire to escape from a land-locked position is a frequent *casus belli*. Russia in her eastward march, and in her century struggle for Constantinople in an attempt to have outlets other than her ice-bound harbors, offers a classic example. Vladivostock was to be a substitute for Archangel, Constantinople for Riga. What did it matter that other races stood in the way with their aspirations, Russia must push her way to the sea, even though the result be the Crimean War, the Japanese War, and a succession of Balkan Wars, abetted if not fought by Russia. Today we see Poland and Jugo-Slavia pushing weaker peoples out of their way in their rush for harbors, each act of aggression a spark which might fire the magazine of European Nations anew. Jugo-Slavia feels justified in shoving Albania aside, Albania feels justified in resisting; who can tell which will be considered right by history? In any case, the result is war based again, as always before, upon the acquisitive urge. Reasons, true and false, may be given *ad infinitum* by all sides, but when they are all sifted, one fundamental fact stands out, one nation is seeking to take something which another nation holds.

Somewhat similar to the above is the armed retention by nations of favored waterways. Turkey fought to keep the Straits, England has battled for Gibraltar and Suez, and the United States would use its last drop of blood for the Panama Canal. True in these cases the attacked are not seeking plunder, *but the attackers are.* Again one nation tries to take possession of another.

Numerous other superficial causes of war exist; annexation of territory (the Balkan Wars for example, and the Greek drive against Angora); search for subjects for conscripts (an example of which will come readily to the reader's mind); defense against border tribes (England in Northern India or Spain in Morocco); protection of nationals (the Vera Cruz and other incidents). Such classifications could be multiplied indefinitely, but as they are all superficial, and as all could ultimately be traced to the acquisitive spirit, no more time need be spent on them, and we can proceed to the dominating cause of modern wars.

Wars of today are above all economic in origin. They may be set off by any match, and they may be complicated by minor motives, but fundamentally they are due to economic reasons. Europe is in need of large supplies of raw materials and of markets in which to dispose of their manufactured products. Few, if any of the European nations are self-supporting; Germany during the World War was nearest so, but even she resorted to innumerable substitutes for the things which she could not supply. Of Europe after the war, France is nearest to being self-dependent, but a glance at her foreign trade shows to what extent she must rely on other parts of the world for her needs. England would literally starve in a very short time if cut off from the rest of the world, and would be bankrupt if her markets for manufactured goods were lost. The industrial nations (and these comprise the great powers of the world) must all buy a large part of their raw material and their food from other countries, and to secure funds with which to pay for their purchases must sell a large part of their finished products. For example, England buys cotton from the United States, adds thereto a certain amount of labor, and sells a finished product to India for a sufficient sum to pay the cotton grower, the labor, the transportation, etc., and if possible for an additional amount which will assist in reducing

England's foreign debt (or before the war in enabling her to retain her place as a creditor nation). The United States is more favorably placed as she has large stocks of raw materials, grows her own food, and has a tremendous domestic market in which to dispose of her manufactures, but even she secures silk from Japan, sugar from Cuba, coffee from Brazil, toys from Germany, etc. It can be seen that each nation must be on the alert to further her own interests, and the question arises, how this can be done.

Of course between nations having friendly relations, trade is constant, but in the event of war, starvation or bankruptcy may ensue. Alliances are of small avail, and each nation must in the final analysis rely on her own endeavors. This means that, if possible, a country should actually possess lands containing the raw materials she desires, and other lands in which she can dispose of her wares. It is better economically (if not morally) for England to possess her own cotton stocks than to rely upon the United States, even though there be no cloud which might betoken strained or broken relations. It is the same fact which makes the farmer more independent than any class of city dwellers. But each nation has similar views and similar ambitions. Whether it is England desirous of controlling the wheat and wool supplies of Australia, Japan reaching out for the markets of China, or France expanding into Africa, the basis of such acts and desires remains the same. No attempt is made in this article to judge the right or wrong of national ambitions, but solely to record facts as they exist.

The result of the various strivings is easily seen; sooner or later two nations need the same coal lands, the same cattle country, or the same markets, and the endeavor of each to satisfy its aspirations leads to antagonism which results in war. It is not always a matter of desire, but sometimes a case of life and death. The conditions in each country may be such that the possession of such territory or spheres of influence may be absolutely necessary to prevent starvation or ruin.

The World War had many elements in its cause; jealousy, revenge, ambition, greed; but few will dispute that at the bottom it was based on a desire on all sides for raw materials and markets. Germany, it was true, was influenced to a large extent by

her professional militarists, but how much more so by her desire for trade advantages? England became involved because of the violation of Belgium and her pledge to France, but even if these causes had not existed, she could not have been unconcerned over the German attempt to grab the trade of the world. She had to fight to protect herself. There is no need to trace out all the complications involved; they are too recent and too well known to need explanation. But it is desirable to emphasize that the World War (as typical of any economic war) was an attempted robbery. It was the old case of one nation desiring to possess itself of another's assets by force. The technique, the superficial side, the alleged justifications may have been new, but basically it was no different from the wars of two thousand years ago. Once again, robbery disguised or politely ignored, was dominant, once again force was invoked for acquisitive purposes.

Now, we have arrived at a point where we must ask why. Wars with few exceptions, have injustice on one or both sides, wars are ethically wrong, robbery is universally denounced, but still armed conflict exists. Why is this so? Does the world care more for might than for right? Is there any reason why banditry should rule and not morality? It is believed that the answer was set forth over a hundred years ago by an English clergyman who proclaimed that the tendency of population was to increase faster than the increase in food supply, and that certain checks to such increase must necessarily occur. The doctrine of Malthus has long been taboo because of its horrible implications, because it was opposed to those who proclaimed,

> God's in His Heaven
> All's right with the World.

but it is necessary to review his theory in the light of more recent events, to determine whether or not it is still true, and how much of the war can be traced to it.

The tendency of population is increase in a geometrical ratio with no limit, while land becomes arable and the food supply increases in an arithmetical ratio with a very definite limit. When the population increase outruns the food increase, the former is held down or cut down by certain checks as wars, famine, disease, until equilibrium is again restored. The checks are ex-

ceedingly drastic, not only among mankind but among other animals. It has been estimated that if the progeny of a single pair of flies increased without restraint, in the course of a single season flies would cover the surface of the earth to the depth of at least one foot. Similarly, a single pair of fishes could crowd all the water out of all the seas in two or three years. But nature in reproducing life, is as energetic in keeping it within limits. And man, unfortunately, also suffers from the prolific orgy and from the wave of destruction. These things are, of course, too well known to require comment, except in so far as their relation to war is concerned.

The basic cause of wars seems to be the urge of expanding population. A people outgrows its former habitat, sustenance cannot be secured at home for everyone, many must emigrate, markets must be sought for manufactured goods and sources of supply for raw material, etc. If the urge is great enough, and in many parts of the world and at all times during history it has been great enough, the overflowing population (or market demand which is roughly proportional to the population) must seek new territories. But in this expansion, other peoples, similarly circumstanced, are encountered, and necessarily conflict will occur. The resulting war is inevitable, not because of a conscious, willful desire on either side, but because it is a matter of life or death, the old jungle law applying to man, self-preservation. It is fight or starve, exterminate or be exterminated. Of course, superficial causes overlay all this, from religion to national honor, upholding a dynasty to self-determination, but beneath it all is the base of over-population.

A glance at a few wars shows the truth of the statement. Viewing history in a broad sense, wars have been composed almost entirely of successive waves of invasion of Europe by hordes from the East (together with counter attacks), and what might be called civil wars between members of the white race. This, it is true, does not tell the whole tale, but it covers the greatest conflicts, the ones which have had the most important results. From time immemorial the East has moved westward. At some far distant time our ancestors, the original Aryans, came from central Asia and practically annihilated Neolithic man (with the exception of a faint strain still existent in one or two

parts of Europe). What sent them westward we do not know, but judging from subsequent events, we imagine it due to the urge of increasing population. For three or four thousand years the Aryans, and the semi-Aryanized Slavs have withstood countless attacks from Asia. The Persians, Visgoths, Huns, Moors, Turks, Tartars, one after another have poured their hordes upon Europe, each in turn pushed onward by resistless pressure from behind. And this pressure was population. Asia, the mother of the human race, has been prolific, her progeny have been as the sands of the sea. And so it must be. Food did not increase as fast as the population, and new lands were needed to avoid starvation. In the expansion millions of men have been destroyed, Nature using war as a check.

In times of relief from the peril of invasion, Europe has used civil war as a check, for wars between white races are but civil wars in a large sense. Expand or die was the law, and all sought victory which meant life. This elemental urge in time became overlaid with a real desire on the part of man to fight, a desire for honor or glory, a desire for loot as an end in itself, but these were all incidental, almost accidental one may say, brought about by the human impulse to ignore the grim reality. The production of food has increased, lands support ten times the population they did a few centuries ago, due to modern methods, improved implements, knowledge of crop rotation, reclamation of previously non-arable land and to a number of similar reasons, but population has kept just a pace ahead of sustenance, so that the specter of famine is always present. When population advances an extra step, the natural checks arise, and among other disasters, wars arrive. This, of course, is not a matter of weeks or even years, it is not consciously considered by statesmen, it is not always directly traceable, but it does occur. There is a limit beyond which, at any given time, population cannot safely go.

The World War was a typical example. England in 1500 A. D. had possibly 2,000,000 souls, Europe as a whole perhaps 60,000,000, all that could be supported. Agriculture was so indifferently followed and so ignorantly practiced that tremendous famines kept the population within limits, aided by war and disease. In 1800, three hundred years later, the European population numbered 150,000,000, an increase of 150 per cent. But in

1914, the population had gone to over 450,000,000, an increase of 200 per cent in one-third the time. This of course was caused by the industrial revolution. But what happened? Europe could not feed herself, so she was forced to secure food elsewhere, either by conquest or by purchase, with the latter being the most prominent means. She could not supply raw materials for her factories, so these had to come from other parts of the world. She had to comb the globe for markets for her products. Now if only one country had thus expanded, there would have been little or no trouble. But all grew, and in their expansion touched the advancing waves of the other, just as ripples from two stones thrown in a pool meet, and when contact was established, war began, trade war at first, then diplomatic war, and finally the catastrophe of military war. It was inevitable, it was a matter of kill or starve. This is the real basis of war, the reason for the robbery which has caused so many conflicts.

This same cause has existed since time immemorial, sometimes complicated or continued by superficial reasons, but basically the same. The invasion of Europe by Islam was on the surface a religious war, but actually it was but another case of a horde from the East pushed against on one side by other farther eastern hordes and in turn expanding into the West under the elemental urge of excess population. Those involved had no realization of this cause, but it was present and dominant. Later as a reaction came the Crusaders, a counter offensive against Islam, not necessarily a conflict for territory for increasing population, but certainly related to the previous invasions from the East made necessary by such increases. Still later came other pushes, hurling their masses to the walls of Vienna under the same pressure, and were checked by the Nordic races of Europe who were also expanding.

The story of Rome affords a striking example of the truth of the theory. Internecine wars only were the rule until the peninsula became over-crowded and hunger ensued. Then, and not until then, was conquest attempted on a large scale. The Romans fought outwardly for glory, for gold, for the honor of their gods, but fundamentally their wars were for food. Carthage was not merely a military enemy or a trade rival, but she also sought possession of the granaries of the Mediterranean. Rome

needed grain to feed her peoples, and grain could be had from Sicily and Egypt. Carthage needed grain for her inhabitants and looked to the same sources. The conflict was predestined, each nation must conquer or starve, and one had to perish. It was a great struggle, long and bitterly contested between two races for food. Increasing populations could not all be fed by the existing food supplies, and the surplus had to die. Similar causes led the Romans east, west and north; it was not only glory, but the pressure of population that sent forth the legions of Caesar in search of food and raw materials.

England gives another example. Her marvelous world-wide expansion beginning in the Elizabethan reign was but an outpouring of her excess children, unable to be fed at home. Her struggles for North America and India, her colonization of waste lands from Jamaica to Australia, her control of the sea were all episodes in the expansion of the race, were points of contact with other widening circles. Raw materials, markets for manufacturers, and above all food were needed for self-preservation. England could not support herself by home efforts alone, and had to seek abroad. So her sons went forth seeking that which was needed, warring with their enemies, tearing territory from the hands of the weaker opponents, ever seeking to supply those left at home with the means of life. It has been a magnificent epic of the law of the jungle, never to be finished.

Examination of the history of races, of the age-long conflicts all shows the same result, population increasing faster than food, always struggling for existence, and checking itself automatically by the losses in wars for the means to sustain life. The same situation exists today; look where you will and you will see lands overcrowded. China with her 400,000,000 pacific population suffers under a succession of famines, and wars inflicted on her from without. Japan in her small islands cannot feed her 60,000,000 mouths, and must expand. Her sons must leave their homeland, or food must be imported. The former is hedged by white protest, the latter by white competition, both points of contact of the widening circle which could lead to war. She must expand or die, but everywhere she meets other expanding forces faced with the same predicament. Central Europe despite war losses is still overcrowded and starvation stalks through the

land. With no food and no trade, Austria faces death, but her attempted expansion is met by the oncoming wave of other nations. Italy sends her surplus to Tripoli, France to Morocco. England cries for more and more markets, more and more food, and meets others with the same needs. Everywhere the story is the same, prolific nature shows reckless prodigality in the creation of man, and a wanton callousness in his destruction. North and South America have escaped to a considerable extent from the cry for food, but their day will come. The 110,000,000 of the United States is but a portion of those which could be supported. But the increase is tremendous, by leaps and bounds, and in the not far distant future, privation and then starvation can be seen. Some must die that the rest may live is the cruel law, and it is from the inexorable decree of Fate that wars will result.

Is there a solution? Is there a panacea for this grave ill of over-population, actual or potential? Dr. Kato, head of the Department of Medical Affairs of Japan, who has spent some years studying the subject, has stated that his Government is convinced that it must, as a national policy, either limit the growth in population or fight a war of aggression in the next generation. Unless increase cease Japan must find room for her surplus population. It is not a matter of theory, but grim reality that faces her. But can she voluntarily reduce her population, or can any nation stop its increase? For one country alone, it is impossible; for that country, reduced in man power, would fall before the onslaughts of her more powerful neighbors. All countries must agree, and *must be able to carry out their agreement,* or no country dares reduce. But what influence, public or private, ethical or religious, can reach the masses of mankind, the peasants of Russia, the industrial workers of England, the farmers of the United States, and the myriads of the East? No influence of today can do it. No power of today can say "thus far and no further" to the tides of mankind.

But the question must be solved to save civilization from a plunge into the abyss. Population must be held in check, no nation can double her population in the next century as she has in the past or horror beyond conception will result. Peace on earth is the ideal, but no efforts of statesmen or religious leaders can secure it if starvation is the alternative; a nation choosing

between war and famine will always choose war. Sermons may be preached, armaments may be scrapped, the popular will may recoil from war, but when the pressure reaches the limit, war will result, just as surely as a boiler will burst with no safety valve provided. The thought is not pleasant, it has long been taboo, but it must be faced. England with her 40,000,000, Japan with her 60,000,000, United States with her 110,000,000 cannot view with equanimity the prospect of the next century bringing the same percentage increase as the past century. Long before such increase occurred, hunger would drive hordes forth to the most bloody slaughter, before which the World War would seem a petty tribal fray. The problem is imminent. It must be faced and a solution found or mankind will go from war to war inevitably, until through strife and exhaustion the rich heritage of civilization is lost.

DISCUSSION

Athletics, Beneficial and Otherwise

(See page 1609, October, 1923, PROCEEDINGS)

CAPTAIN D. N. CARPENTER, U. S. NAVY.—Among the older officers in the Navy there is perhaps no one whose interest in and knowledge of athletics at the Naval Academy warrants his speaking with more authority than Admiral Niblack. Reviewing the development of physical training of midshipmen, it will be found that there was a decided advance made at different periods, due to the influence of certain individuals. Dr. Byer emphasized the importance of a knowledge of hygiene in the education of naval officers, and established a system of measurements and tests by dynamometers and spirometers which continued in existence until replaced by the universal dynamometers. Professor Dashiell developed an interest in football and taught the value of skilled coaching in athletics. Dr. Bogert brought the medical department more closely in touch with athletics and physical training. Dr. Howard Ames emphasized the importance of adhering to a high physical standard in the examination of candidates for entrance. Admiral Niblack and Dr. Murphy established the present system of scientific tests of muscle groups by the universal dynamometer, and were active in the development of the Swedish method of exercises. Commander Douglas Howard's influence on athletics at the Academy has been very marked. Lieutenant-Commander W. A. Richardson systematized and organized the training methods in every branch of Naval Academy athletics, and now the midshipman has this information available in the *Manual of Athletic Requirements*.

Admiral Niblack's article reveals the need of physical examination and training of our school children. Although this is being done to a certain extent in most of our large cities and communities, there is opportunity for greater development. Any organization which has the aim of the National Amateur Athletic Federation of America should have our heartiest support. The Army's experience in the examination of drafted men during the war produced a profound impression on the medical profession and those interested in eugenics. Examination of candidates for entrance to the Naval Academy has for several years shown a rejection of about sixteen per cent (16%). Before opportunity of preliminary examination was given, the rejection averaged about twenty-two per cent (22%).

The one great danger of organized athletics is over-emphasis on the training of a few individuals for competitive sports. Admiral Niblack

recognizes the need of general participation and shows how the Naval Academy system provides for it. During the present administration, it has been found possible to arrange studies and drills so that members of teams do not have to be excused for practice. It must not be forgotten that the academic training for their profession as naval officers is of paramount importance. The value of athletics in training for leadership is not touched on by Admiral Niblack and should be mentioned.

In his comments on English sports, he speaks of their attitude toward "coaching" and the spirit of not going in for sport "just to win." At the Naval Academy, officer coaches rather than professional are utilized in several of the major sports. It is the opinion of the writer, that it would conserve the sportsmanlike spirit if no professional coaches were used in any of the sports.

Referring to Admiral Niblack's personal experience with the Medical Department concerning a heart murmur and defective physical development, his case illustrates the importance of maintaining a high standard of entrance. Midshipmen should be physically qualified to meet the requirements of athletic training. The exception does not prove the rule, even though Admiral Niblack has had health and strength during a brilliant career in the Navy. Heart murmurs constitute the most difficult problem the Medical Board has to solve. Twenty to thirty per cent of the midshipmen now at the Academy have been passed with cardiac murmurs noted on their records, believed to be "functional" and not due to heart disease. Many of these cases clear up while under physical training; some cases develop a murmur. Occasionally a case, which was believed to be functional, develops symptoms which prove that the murmur was organic. No instrument of precision has yet been found clearly to differentiate these murmurs.

Admiral Niblack's statement that the Medical Department is backward in not recognizing the value of osteopathic practitioners for duty on the staff of the Naval Academy gymnasium, is evidently based on his belief that osteopathy gives a "peculiar knowledge" not possessed or required of medical officers. Possibly the Admiral is not familiar with the development of physiotherapy and the recent establishment of the latest equipment in many of our naval hospitals. So far as the theory of "readjustments" is concerned, medical officers would probably agree that this "peculiar knowledge" holds no interest for them. On the other hand, some, including the writer, believe that osteopathy has utilized a valuable therapeutic aid which has been neglected. Physiotherapy includes active and passive movements with massage, when necessary, and these the writer believes to be the important factors in osteopathy. The Japanese as a nation have long recognized the value of massage and made it a legal monopoly of the blind. The Swedish physicians have also used massage extensively. Physiotherapy comprises in addition the latest methods of application of heat and cold, electricity, and light. Admiral Niblack would be the first to recognize the value of physiotherapy if familiar

with its application. "Misery Hall," the gymnasium medical department, has advanced considerably in equipment during the past few years. After four years' recent service as Senior Medical Officer, the writer cannot subscribe to Admiral Niblack's statements as to the scientific value of osteopathy, or as to its need at the Naval Academy. His article should be of great interest in bringing to the attention of the Service the present system of physical training at the Naval Academy and the value of athletics in general.

Navy Gunnery School

(See page 949, June, 1923, PROCEEDINGS)

LIEUTENANT PAUL S. SLAWSON, U. S. NAVY.—The service should have an active progressive Gunnery School for the training and indoctrination of the younger officers and for the trial of new material and theories.

While the course in gunnery at the Naval Academy covers the subject thoroughly as far as is possible from the textbook standpoint it is not believed that the midshipman can assimilate and appreciate all that he is brought in contact with even though the drills and fire control equipment now used at the Academy are very complete.

Upon graduation the young officer usually becomes a turret or broadside junior officer and it is here that he first comes in real contact with the various matériel and methods for its use. As the gunnery year progresses he sees that there are several ways of accomplishing the same thing, several systems of tactics in firing the different practices. Even on a single ship where the doctrine is governed by the gunnery officer there usually are widely diverging opinions as to how certain things should be worked out. The young officer is bound to look into these different methods and will decide in his own mind what is best by the results of the practice.

The element of luck certainly does enter into results and the officer may be won to really faulty methods by the fact that they were fortunate in the one or two instances noted.

Under the present system of assignment of officers the graduate sees one or two years or perhaps three on a battleship and is then sent to destroyers. During this interval on the battleship his whole time is usually spent in broadside, turret or plot and while he becomes proficient in his own branch and able to take charge of his division in battle practices he ordinarily does not get a thorough intimate operating knowledge of the other branches of gunnery.

At this stage the officer is detached and goes to a destroyer and very likely may become the gunnery officer. He has formed certain opinions, the correctness of which is more or less a matter of chance. His first gunnery year will be an experiment; if he is fortunate enough to take her through another year the results will usually be much better.

Such a case has come under the writer's observation. Only at the end

of the second gunnery year did good results begin to appear. These were due partly to experience gained in the past but more directly because the gunnery of the squadron was directed by an ordnance post-graduate.

Had the gunnery officers of this destroyer squadron gone through such a school as suggested by Lieutenant-Commander F. S. Craven in his article "We Must Have It," the first year and a half would not have been of the experimental nature that it was, as the rudiments would have already been grasped and this time and ammunition could have been used in still farther advancing our knowledge of gunnery.

There is also the case of the young officer who does not have the advantage of going through one or more gunnery years on a modern battleship and who becomes a destroyer gunnery officer. His problem is even more difficult and his first few practices are bound to be purely experimental in things which have long been known.

For these reasons it is believed that each officer after three years' sea service should be sent to such a school as recommended by Lieutenant-Commander F. S. Craven, for by that time he will have had considerable practical experience and will be able to take up, study, and appreciate the higher grades in the science of gunnery. Only by this method can our practical experience become cumulative at the greatest rate.

The Naval Academy of Today and Its Mission

(See page 453, March, 1923, PROCEEDINGS)

An Editorial from the Baltimore *Sun*, 31 July, 1923.

A REGENERATING MISSION.—During June, July and August the Naval Academy at Annapolis is engaged in one of the quieter phases of the general work to which its officials devote themselves, in one way or another, from year's end to year's end. When in June the graduating class has received its honors and assignments to duty, and the three other classes are on the regular summer cruise learning to apply the principles of seamanship which they have been studying, a new plebe class starts life at the Academy. It is a wise arrangement that allows these youthful recruits during the quiet summer season an opportunity to grow familiar with their new environment, to become accustomed to naval requirements and imbued with the spirit of the great institution of which they are to be a part. It is, perhaps, the most influential period of the four years, because their minds are then in a peculiarly receptive state, and they are likely to get in these introductory months impressions that are permanent, and to develop an attitude toward life far more important than book learning or the mastery of scientific technicalities.

Maryland is particularly interested in the Naval Academy because through its location at Annapolis it has become almost like the offspring of her own heart and brain. But it is almost as close to the interest of thousands of people in every other part of the country, and as the nursery of the Navy bears an intimate relation to national welfare as well as to

patriotic pride. When a new plebe class, therefore, is flocking to the colors and receiving its naval baptism something is going on that touches deeply national fundamentals and national stability. A new naval legion is in the making, and in the apparent calm of the Academy is receiving a vital and lasting direction.

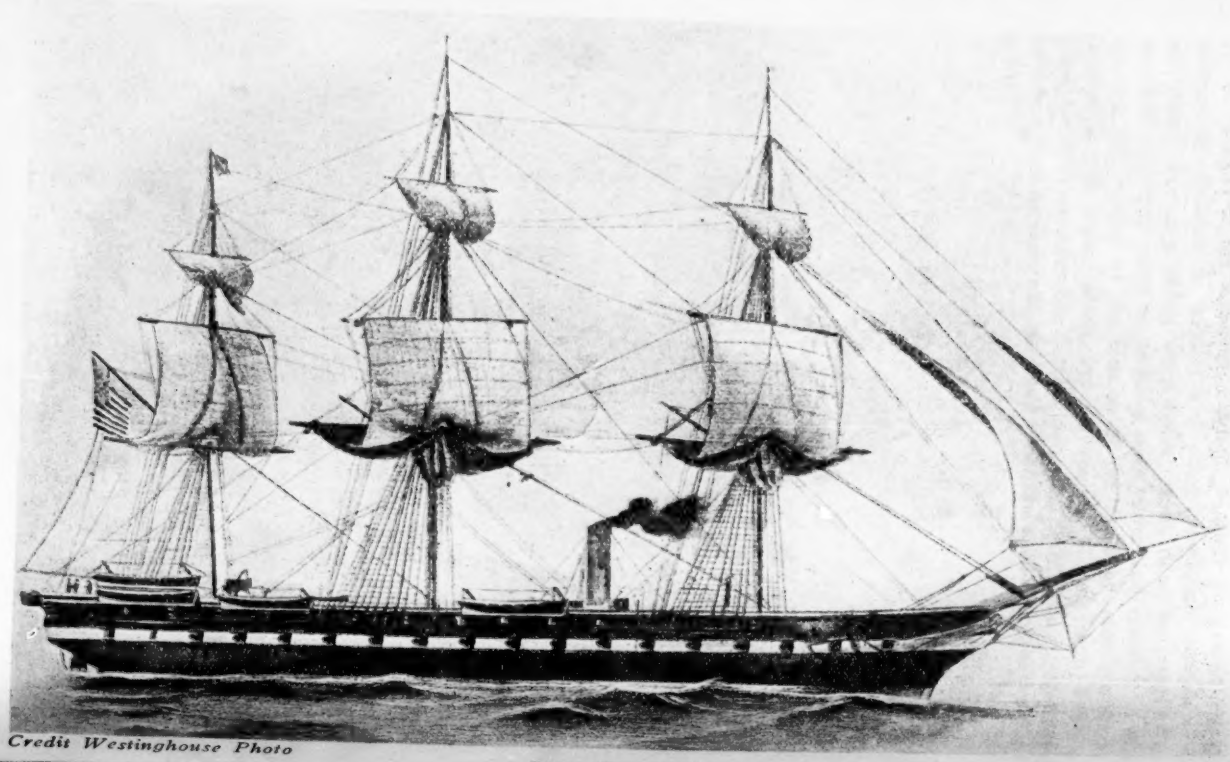
It is a rather trying time for the lads who have come together from every section of the Union, some of them thousands of miles from home, and unless wisely handled, some of them may become disillusioned before they have fairly started, or get an entirely false conception of what they have undertaken to do. For this reason the present superintendent, Admiral Wilson, has been endeavoring to emphasize more and more the moral purpose of our splendid naval training school. And we assume that while the older classes are away getting acquainted with the element on which they are to spend a large part of their lives, the new contingent is having impressed on it the things which are above all else essential to success.

What these things are, what the fundamental code of the Academy is, was excellently stated in a paper by Lieutenant-Commander Mahlon S. Tisdale, United States Navy, in the issue of the United States Naval Institute of March, 1923, entitled "The Naval Academy of Today and Its Mission." Most people, and probably most of the boys who go to Annapolis with the title "Admiral" in the back of their heads, have supposed the mission of the Academy was to train scientific fighters, to develop John Paul Joneses, whose souls would know no such word as surrender. That's some of it, but not all or most of it, as Lieutenant-Commander Tisdale points out. The supreme mission of the Academy, as he defines it, is "to mold the material received into educated gentlemen, thoroughly indoctrinated with honor, uprightness and truth, with practical rather than academic minds, with thorough loyalty to country, with a groundwork of fundamentals upon which experience afloat may build the finished naval officer, capable of upholding, whenever and wherever may be necessary, the honor of the United States." With this there must be also "healthy minds in healthy bodies," and "a humane yet firm and just discipline" that will beget the "fullest efficiency" and a lasting "respect and admiration for the Academy."

With this fine text Lieutenant-Commander Tisdale elaborates his theme in a way which should be an inspiration to every midshipman who enters the Academy, and which gives the general public a new idea of what it is trying to do. "Character building," not sailing ships or firing guns, is its highest purpose. "High standards of character," said the present superintendent in a letter to the Secretary of the Navy last year, "are vital in a military organization. Men in other walks of life may trifle with the truth in everyday affairs and suffer little as a consequence. We cannot be so tolerant. The fundamental of an officer's value to the service is his trustworthiness."

Lieutenant-Commander Tisdale's pamphlet should be a moral textbook

for every class at the Academy. Indeed, it might be studied with advantage by civilians in general and other educational institutions in particular. For at a period when honor, truth, duty, responsibility and unselfish patriotism seem to be losing their force and meaning in other spheres, this voicing of the mission of the Academy sounds a stirring trumpet call to higher ideals, not only to the ardent youth within its gates, but to every American man and woman. Only through regenerating influences such as these can the country find the road to moral health and safety.



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FIRST "COLORADO"

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER H. B. HIRD, U. S. NAVY

AND

LIEUTENANT J. B. HEFFERNAN, U. S. NAVY

GENERAL ARRANGEMENT

VESSELS BUILDING, NAVAL POLICY, MATÉRIEL, PERSONNEL	Great Britain	1881
	France	1891
	Germany	1897
	Japan	1899
	United States	1904
MERCHANT MARINE		1911
ENGINEERING		1915
AERONAUTICS		1923
ORDNANCE		1930
NAVIGATION AND RADIO		1935
MISCELLANEOUS		1938
CURRENT NAVAL AND PROFESSIONAL PAPERS		1943

GREAT BRITAIN

NAVAL POLICY REQUIRES AIRSHIPS.—The advantage to the Admiralty is self-evident, once it is admitted that the naval policy requires airships. Once that question is decided in the affirmative, only two courses are open: (1) To provide the whole of the money; or (2) To take the risk (in the form of a guarantee) and provide only a small portion. I would rather lay claim to Governmental assistance on the Imperial aspect, but I am prevented from doing so by Mr. Lloyd George's statement in the House of Commons in July last, when he remarked, "No money is to be expended by way of subsidy on a commercial airship service or upon Imperial communications," and he further said that he had appointed a committee to investigate the uses of airships in war time. However, if the line of reasoning is agreed up to this point, it is clear, from the point of view of practical politics, that the only way of obtaining the necessary Government backing is to make out the case for the uses of airships in naval warfare.

Mr. Lloyd George's Committee has now made its report, and I do not think I shall be exceeding the bounds of discretion in giving some of the arguments I used before that Committee. I have already indicated the capacity of one of the new vessels from the commercial standpoint, but from the naval side I think it would be better to consider the possibilities of such a vessel when used entirely for reconnaissance purposes. Under these conditions the whole carrying capacity can be put into extra fuel

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First "Colorado"

and wireless equipment. The result of this would be to increase the range of flight to 12,000 miles at 80 m.p.h., or to 24,000 miles at 40 m.p.h. In other words a vessel could remain in the air for nearly three weeks without alighting to replenish with fuel.

A Comprehensive Survey

To obtain a comprehensive survey of the position, however, I will briefly indicate the probable effect of an airship organized as a fighting unit. When used in this way, it is difficult to separate the functions of the two classes of air machines, as each is the complement of the other. The aeroplane may be termed the gun or torpedo tube of the airship, and the greatest air-striking power is undoubtedly the largest airship carrying aeroplanes; the planes themselves carrying torpedoes, bombs, or poison gas.

The advantages accruing to these two classes of air machines working together would seem to be as follows: The aeroplane, although not protected with armor, can attack with a good prospect of success by virtue of its very high speed and three dimensional movements. Nevertheless, it suffers from a defect so grave that it cannot replace any form of fighting ship, whether battleship, cruiser, or destroyer. That defect is its limited radius of action. The airship remedies this defect by giving to the aeroplane a speed and range of action in excess of any floating vessel. The airship, on the other hand, presents a target larger than a battleship, and is, therefore, an unsuitable vessel to attack by itself. The aeroplane removes this defect by increasing the gun range of the airship by the radius of action of the aeroplane it carries.

The last war showed that any vessel was jeopardized if hit by a torpedo, and it is obvious that the type of carrier can have no bearing on the result, whether aeroplane, submarine, or destroyer. The torpedo is the essential factor. The two new battleships now being built are to be protected from torpedoes by extra bulkheads, saddle tanks, internal armor, and other improvements of a technical character, and it is suggested that they will be enabled thereby to withstand the attack of four or five torpedoes before destruction occurs. But does any reasonable man suppose that the answer will be other than to construct torpedoes of five times the destructive power of those now made? The battleship will then be in the same danger as it is today—one torpedo correctly placed will so incapacitate her as to render her an easy prey to a fresh attack.

The Basic Conditions of Sea Power

Bearing this situation in mind, it seems essential to analyze the basic conditions of sea power, if the real effect of air power on sea communications is to be evaluated. History has shown that the prophets who foretold the elimination of the battleship by the torpedo boat and the submarine were wholly incorrect. Today, an agitation is taking place to concentrate entirely upon aircraft and this is opposed by a section of opinion which claims that so long as our floating trade is carried in floating vessels, so long, therefore, must floating warships defend that trade, and, since the battleship is the embodiment of sea power, it is essential to maintain battleships. Surely, neither of these two schools of thought can be wholly correct as the British Navy exists to perform two main functions: (1) To secure the sea for the transport of British merchandise, troops, etc.; and (2) To deny the sea to the ships of the enemy. It exists for no other reason. The method by which it attains its objects is either to fight or contain the enemy warships, but it does not exist for that purpose. It is very necessary to distinguish clearly between the political object and the military method by which that object is attained.

If the political object—the safe transport of our troops and merchandise—can be obtained without the intervention of a floating Navy, then there is no reason for a floating Navy at all. It is, therefore, a fallacy to argue that if we wish to transport merchandise on the water, it necessarily follows that the military appliances to enforce that result must also travel on the water. The vital issue must be to consider whether or not existing air machines contain the *possibility of development to such a degree* that they may eventually be able to effect the political object. Two of the conditions precedent to the fruition of such a development have already been discussed, namely, radius of action and power of attack. Let us consider now reliability and costs.

Reliability and Costs

The air-keeping qualities of an airship depend mainly upon speed, and if her speed is high enough she will be enabled not only to maintain any assigned position, but also to make progress in the face of a heavy gale. Statistics show that the modern Zeppelin has flown comfortably in an 80 m.p.h. gale, and as the average gale does not exceed about 50 m.p.h., it necessarily follows that the modern airship, once it is in the air, has as good air-keeping qualities as the battleship has sea-keeping qualities. As regards cost, assuming a battleship to cost as little as £4,000,000 and an airship as much as £250,000, it follows that sixteen airships can be produced as cheaply as one battleship. It is estimated that sixteen airships would carry between them as many as thirty-two torpedo-carrying planes and forty-eight fighting planes. I think it will be readily conceded that if such a force of aircraft was to attack one battleship, it is more than probable that the battleship would succumb. The essential condition is that the planes must be brought to the point of attack.

In considering reconnaissance duties we have the fact that during the war one of the *R* class airships maintained wireless touch with the Azores from the North Sea. How, then, does such a vessel compare for these duties with a light cruiser? An airship detailed for reconnaissance duties can only carry extra fuel in the place of fighting equipment and, when so equipped, would have a range of action of 20,000 miles. It would, of course, be necessary for her to carry a couple of fighting planes to defend herself from planes sent up from a single vessel. A rough estimate, neglecting repairs, interest on capital, depreciation, etc., of the comparative cost of an airship and a light cruiser in searching 1,000 square miles of sea shows that the cost by airship is £1 5s. per square mile and by light cruiser £77. As regards capital cost the same work would be done by a fleet of nine airships as by a fleet of sixty cruisers, the saving in capital cost being £51,750,000. Since armaments must be reduced to a monetary basis, as money is the lifeblood of the fighting Services, it is evident that no Navy can afford to neglect a cheap scouting force which may develop into a powerful fighting unit.—*Army, Navy and Air Force Gazette,* 11 August, 1923.

No Defense Ministry.—The grouping of all three combatant services under a Minister of Defense is one of those schemes which seem excellent in theory but are found, on closer examination, to be hedged about with grave practical objections. It is, therefore, a relief to learn that the Government has definitely rejected proposals to this effect. No Ministry of Defense is to be set up, nor is there to be any amalgamation of the fighting services. The Navy as a whole has always been hostile to suggestions of this kind, much more so than the Army, for reasons not difficult to comprehend. Naval men fear that if the control of all the armed forces were vested in one department there would be danger of

national strategy becoming militarized in the narrowest sense of the term; in other words, that soldiers would eventually gain a commanding position at the head of affairs, with the result that our traditional and well-tried policy of relying mainly on sea power would be departed from. But an even stronger argument against unified control is provided by the patent failure of such experiments as have been made in this direction by other countries. The German Imperial Navy, although nominally independent, was never able to free itself entirely from military leading strings, and upon the outbreak of war it at once lapsed into its original status of a subsidiary branch of the Army. Throughout the struggle German naval movements were largely inspired and directed by military men, who lacked elementary knowledge of the laws and uses of sea power. Going back to an earlier epoch, the principle of unified control was brought theoretically to perfection by Napoleon, yet even his genius failed to make it work efficiently in practice.—*The Naval and Military Record,* 15 August, 1923.

Imperial Defense Committee.—But the Government, while turning down both the Ministry of Defense and the amalgamation schemes, has decided to adopt certain recommendations made by the Imperial Defense Committee with a view to improving co-operation between the three services. The Committee itself has already done invaluable work on these lines, as all who have read the chapters in the official war histories which describe the measures taken to co-ordinate departmental action on the outbreak of war will admit. But the system is defective in that it makes the Prime Minister the sole authority competent to initiate "a consistent line of policy directing the common action of the three or any two of the three services, taking account of the reactions of the three services upon one another"; and in the nature of things the Premier is too much preoccupied with other business to devote more than a fraction of his time to defense questions. To overcome this defect it has been decided to reorganize both the personnel and the functions of the Imperial Defense Committee, and, further, to endow the Chairman, deputizing for the Premier, with a larger degree of executive power. Broadly outlined, his duties will be as follows: (1) To preside over the Committee in the absence of the Premier; (2) to report upon and elucidate to the Premier such recommendations as may be made by the Committee in the former's absence; and (3), with the assistance of the three Chiefs of Staff, to keep the defense situation as a whole constantly under review, so as to ensure that defense preparations, plans, and expenditure involved therein are co-ordinated and framed to meet policy, that complete intelligence as to the current naval, military, and air outlook may always be available for submission to the Committee, and that resolutions as to requisite action may be put forward for its consideration.—*The Naval and Military Record,* 15 August, 1923.

A Super-War Staff.—Another very important reform relates to the functions of the three Chiefs of Staff. Hitherto these officers have only been required to tender advice on matters of policy pertaining to their respective arms. From now on, however, each is to be clothed with "an individual and collective responsibility for advising on defensive policy as a whole, the three constituting, as it were, a Super-Chief of a War Staff in commission." This system will, of course, entail frequent conference between the three officers concerned, thus bringing the "brains" of the naval, military, and air services into closer touch than before. It is significant of the waxing prestige of the air arm that an assistant secretary nominated by the Air Minister is to be appointed to the Committee, whose status will be identical with that of the three assistant secretaries who

already represent the First Lord of the Admiralty, the Secretary for War, and the Secretary for India. Thus, in the Imperial Defense Committee, at any rate, the three fighting services will be on a footing of equality. The Government has also decided to suppress the Standing Defense Sub-Committee and merge its functions into those of the parent committee. To the labors of this sub-committee, which was formed in January, 1911, by Mr. Asquith at the instigation of Mr. (now Lord) Haldane, we owe the compilation of the famous "War Book," which laid down the action to be taken by every department of the public service in times of national emergency. Admiralty representatives on this sub-committee were the Director of Naval Intelligence and the Secretary, and when the Naval War Staff came into being its chief was also made a member. Most of the work performed by a body such as the Imperial Defense Committee is necessarily hidden from the public. All its proceedings relate to naval, military, and cognate questions of policy, and actual war is the only test by which the soundness of its decisions can be judged. In its reorganized form it should be better equipped to deal with current problems of defense, some of which are novel in character and more complicated than any which have had to be solved previously.—*The Naval and Military Record,* 15 August, 1923.

THE SIXTEEN-INCH GUN ERA.—If the unofficial reports which credit our new battleships with an armament of nine 16-inch guns apiece are correct, these vessels will have the distinction of being the hardest-hitting men-of-war in the world. Both Japan and the United States already have battleships in service mounting guns of this caliber, but in their case the number is limited to eight. As the Admiralty adopted the 16-inch gun in order that the British Navy should have at least two ships equal in caliber to the strongest vessels in foreign service, it is reasonable to infer that its ballistics will not be inferior to those of the American and the Japanese guns, which are of 45 calibers. Vickers' 16-inch model is 741.25-inches long, weighs 117 tons, and discharges a 2,240 lb. shell with a muzzle velocity of 2,450 ft. secs., developing an energy at the muzzle of 93,230 ft.-tons. This projectile will penetrate fifty-seven inches of wrought iron at the muzzle, and the gun can be fired at the rate of 1.2 rounds per minute, or six rounds in five minutes. The weapon in question is of steel and wire construction, but the firm lists an all-steel built-up gun of the same caliber which, although lighter, fires a heavier shell with increased velocity and energy. This all-steel piece is only 43.65 calibers in length; the projectile weighs 2,461.2 lb., and will penetrate sixty-three inches of wrought iron at the muzzle. Elswick has a 16-inch gun which fires projectiles of 2,130 lb. at the rate of two rounds per minute while the Beardmore model of like caliber is a 2,100-pounder, whose rate of fire is not indicated. The weight of the American 16-inch shell is 2,100 lb., and that of the Japanese projectile about 2,250 lb. It is understood that the *Nelson* and the *Rodney* will carry their nine big guns in triple turrets, a form of mounting which has not hitherto been approved by British gunnery experts, though introduced into other navies more than ten years ago. But it has the advantage of economizing weight, and this is a factor of paramount importance in the case of our new ships, which are restricted by treaty to a given displacement.—*The Naval and Military Record,* 15 August, 1923.

TRIPLE TURRETS.—The first British triple mounting for heavy guns appears to have been designed and built not long after the war, for in February, 1921, it was temporarily installed in the monitor *Lord Clive* and used to bombard the ex-German battleship *Baden.* There is little

doubt that the guns so mounted were of 16-inch caliber. The chief objection to this form of mounting is the "jump," or deflection, said to be caused when the wing, or outer, guns are fired. This, however, can be overcome by synchronizing the discharge of the two outer guns, as is done in American ships with three-gun turrets. Admiral Twining, who as Chief of the Bureau of Ordnance was responsible for designing the first mountings of this type for American ships, stated in 1912 that while he disliked the idea of a triple turret, he nevertheless recommended it as the only method by which the weight needed for additional protection could be saved. Mr. S. V. Goodall, of the Royal Corps of Naval Constructors, who was on board the U. S. S. *Tennessee* when that ship carried out her gun trials, subsequently gave an interesting account of the triple turret in a paper read at Portsmouth. The whole difficulty, he pointed out, lay in designing a three-gun turret to give accurate and rapid fire. The natural position for the ammunition hoist is in the center of the mounting, yet this is occupied by the center gun. "So far as I see it," said Mr. Goodall, "that is the inherent difficulty, and, in my opinion, clever as this (American) design is, a sure and sustained rapid supply to the center gun has not been provided." He did not consider that the jump set up by discharging one or other of the wing guns was sufficient to prejudice accurate fire to any serious extent. Our new ships will be the only ones afloat in which three 16-inch guns are housed in one turret. There is every reason to hope the system will prove successful, but it is a bold experiment considering that these are the last two capital ships we shall be at liberty to build for the next ten years.—*The Naval and Military Record*, 15 August, 1923.

THE CRUISER SHORTAGE.—According to rumors heard in the naval ports, the Admiralty have in preparation a big program of cruiser construction for next year. It is to be feared, however, that in this case the wish has fathered the thought. So far as is known, new construction in the next financial year will be limited to one submarine. The Admiralty, no doubt, are fully alive to the serious shortage of cruisers, but in view of the financial situation it is improbable that they will press for more ships next year. On the other hand, a building program to make good the deficiency in ocean cruising ships cannot be indefinitely postponed. There is, in fact, an urgent need for a considerable number of new ships of this type. The small fleet cruisers, of which we possess so many are practically useless for commercial protection. For this duty ships of large displacement, good speed, and extensive endurance are required. If they are to be fit for their work as sentinels on the trade routes our next cruisers must be designed up to the limit of size permitted by the Washington Treaty: viz., 10,000 tons. A development of the *Raleigh* class, with an armament of 8-inch guns, appears to be indicated. We are informed on good authority that the *Emerald* and *Enterprise* were planned as high-speed ships for service with the battle fleet, and will therefore have a somewhat restricted radius of action. If this be so we shall have no more than three ships—*Hawkins, Effingham, Frobisher*—which are capable of performing the duty of commerce protection in an efficient manner. Were it not for the temporary absence of any threat in the naval area our position would be extremely serious, even alarming, for at no period in modern history has the Navy been so badly off for ocean cruisers. New vessels of the type required are likely to cost at least £1,500,000 apiece, but, however onerous the financial burden, it cannot be shirked. Unless the Navy is adequately supplied with cruisers of the right type it cannot guarantee the safety of the sea routes upon which our existence depends.—*The Naval and Military Record*, 15 August, 1923.

THE "HERMES."—The commissioning of the new aircraft-carrier *Hermes* for her trials at Devonport last week has attracted as much notice as if she was the first vessel of her kind. She is, nevertheless, a very interesting vessel, mainly because she is the first aircraft-carrier in the world to be designed and built for the purpose of carrying naval seaplanes, other ships of the type having been converted from various types of warship. It is, however, largely in consequence of the Navy's agitation for an air service of its own that the *Hermes* has been brought so much into the public eye. *The Observer* attaching so much importance to this question that it devoted its leading article yesterday to discussing the subject. The newspaper thinks that the present system and the adoption of the recommendations of Lord Weir's Sub-Committee are not practical, and states, with regard to the recommendations, that "the so-called compromise contains in itself for anyone to see, the seeds of discord and its own destruction." This is certainly a very strong view, but it may be accurate, although it seems to assume that the Sub-Committee did not know what it was recommending, and that it did not have proper evidence placed before it. Whether such was the case we are unable to say, but, as is pointed out above, the *Hermes* is not the first aircraft-carrier, and the Sub-Committee could have had—if it was not placed before them—evidence from several carriers in which the Royal Air Force has been working with the Navy for some years. In the *Argus* at home, and the *Pegasus* in the Mediterranean, officers and men of the Royal Air Force have been borne since 1920, and from these and other carriers plenty of information could have been obtained not only of the existence or otherwise "of inter-service friction, rivalry, and grievances," but of the manner in which the Royal Air Force had co-operated with the fleet in several operations during the past few years. If the Sub-Committee did not receive such information, its recommendations are not so valuable as they ought to have been. In the United States the Navy and Army each has its own Air Force, and there is no separate organization. It would be interesting to know how dual control works in America.—*The Naval and Military Record*, 15 August, 1923.

NOT THE LAST WORD.—Although the aircraft-carrier *Hermes* is the first ship to be specially designed for her work, it must not be thought that the Admiralty authorities are quite satisfied with her design, for they realize that although probably she will prove herself exceedingly useful in the long series of experiments which she is to carry out, she is not nearly big or fast enough for the work that an aircraft-carrier should undertake. Roughly, she is 11,000 tons, with a speed of 25 knots, and an armament of seven 6-inch guns, but the ideal which the naval constructor now has in view is a ship of at least 20,000 tons displacement, with a powerful battery, preferably of 7.5-inch guns. In the matter of speed, it is felt that the *Hermes* is too slow after the experience with the converted aircraft-carrier *Campania*, which showed that such a ship should be at least two knots faster than the man-of-war with whom she is operating in order to give her time to come into the wind to launch her machines without dropping right astern of her consorts and necessitating the detachment of destroyers for her protection.

Similarly, the general opinion now is that 20,000 tons displacement is the minimum with which a carrier can expect to be operated efficiently if she is to pick up exhausted machines under service conditions, and although the Navy is very glad to have the *Hermes* for the experiments which are absolutely necessary, they pin their chief hope on the former "Hush-hush" cruiser *Furious*, which is now being reconstructed at Devonport, and which should prove herself to be something like the ideal carrier.—*The Naval and Military Record*, 15 August, 1923.

THREAT TO JAPAN SEEN IN SINGAPORE.—"There is no doubt that Japan is the potential foe against whom Great Britain is making preparations in the Pacific, inaugurated by her scheme to construct the naval base at Singapore. The United States is but a secondary enemy, for in the event of a war between Great Britain and the United States, the British and American Navies would fight mainly in the Atlantic. The phrase 'arming against nobody' is utter nonsense. From the strategic point of view Japan is the enemy against whom the warlike preparations in the stretch of water that divides the Indian Ocean and the Pacific are aimed."

So writes Captain Masanori Ito, retired, of the Imperial Japanese Navy, in the monthly magazine *Zaisei-Keizai-Jiho* (Economics and Politics) of Tokio.

The motives which prompted the British to decide on the construction of this base, according to Captain Ito, were twofold: Discontinuance of the Anglo-Japanese Alliance, and because naval men now believe that the range of future naval operations will be over a very wide area.

"When the alliance was in existence," writes the retired naval officer, "British interests in the Far East were perfectly secure. There was then not the slightest necessity for her to maintain a strong fleet in these waters. In fact, it was due to the first treaty of alliance that the main portion of the British Far Eastern fleet was withdrawn to its home waters. Today, without the alliance, Great Britain is compelled to look out for herself. It is plain that she cannot any longer depend on such an abstract thing as Japan's good-will, and the cold truth is that she hasn't a single dock in this part of the world capable of accommodating a dreadnaught."

"It is superfluous to say that the scene of future naval conflicts in which Great Britain may be involved has shifted from the North Sea to the Atlantic and the Pacific, particularly the latter. The Pacific is now the center of the activities of the world, and even the United States seems to be utterly forgetful of the Atlantic over her enthusiasm in connection with the Pacific."

Captain Ito calls the attention of his countrymen as to what would have been the result of the war between Russia and Japan if the former had had a naval base somewhere near Japan. "If that had been the case," he declares, "then the glorious victory gained by the Japanese Fleet in the Tsushima Straits would perhaps have been impossible, and who can say how such a thing would have influenced the course of the war? If this fact is borne in mind even the layman can understand the great value of a convenient naval base."

"Suppose war broke out between Japan and Great Britain at the present moment; the latter would have no choice but to refrain from sending her powerful vessels eastward, for where are the repairs to be made? This ought to be a sufficiently cogent reason to convince any one that it is well-nigh impossible for Great Britain to conduct a decisive war against Japan in these waters at the present time. It is thus natural that she is full of anxiety as to Australia and New Zealand and is casting suspicious eyes toward Japan. The plan of the British Admiralty reflects considerable credit on those at the head of naval affairs in Great Britain."

Captain Ito believes that Singapore is excellently situated for the purpose of a naval base. "Japan and Great Britain are so situated, geographically," he writes, "that mutual preparedness for both is essential. If this view of the matter is taken, then friendship can be maintained, despite naval bases, by means of treaties. Under the present circumstances, however, this is impossible."

Captain Ito then proceeds to outline what Japan should do. He advocates a "wait-and-see" policy for the present, but that she should be on her guard all the time. "If there is even the slightest connection between

the Singapore base and the naval agreement that exists between Great Britain and the United States," he continues, "then the situation is serious; but for the present there is nothing better we can do than to watch developments carefully."

The article of the Captain concludes by doubting if the scheme is a wise one, when the period of time that is to elapse before it is completed is taken into consideration. He believes that it is a sound scheme if it is to be rushed to completion, but ten years from now, according to Captain Ito, armaments will have made such strides that "even if the scheme is not a failure, it cannot be called a success."—*New York Times,* 18 August, 1923.

SINGAPORE BASE COSTS.—The estimated total amount proposed to be spent on Singapore naval base is £10,500,000. £160,000 is provided in the current Navy Estimates, and it is anticipated that £260,000 will be required in 1924-5. Thereafter the annual expenditure will be governed by circumstances. No date has yet been settled for the completion of the works. —(Navy Financial Secretary.)

EXISTING SINGAPORE DOCK.—The existing dock at Singapore will not take the two ships of the *Rodney* class, building, five *Royal Sovereigns,* two *Renowns,* five *Queen Elizabeths* (when bulged), the *Hood* and the *Eagle,* or a total of sixteen ships. Damaged capital ships or aircraft carriers may draw up to 45 ft. We, therefore, cannot rely in war on the dock, whose maximum draught is 33 ft.—(First Lord.)

THE NEED FOR SINGAPORE.—The development of the naval base at Singapore was recommended by the Admiralty in order to enable modern capital ships to be docked and repaired in Eastern waters and to increase the mobility of the Navy generally. This recommendation was endorsed, after exhaustive enquiry, by the Committee of Imperial Defense and by the Cabinet. I do not know whether the Foreign Office was specifically consulted, but, of course, it is represented in the Cabinet.—(Prime Minister.)—*Army, Navy and Air Force Gazette,* 25 August, 1923.

THE SINGAPORE "KEY."—The opposition of Mr. George Lambert, M.P., a former Civil Lord of the Admiralty for nearly ten years, to the Admiralty provisions in regard to Singapore is the more surprising in view of his close association with the late Lord Fisher. Mr. Lambert was in office during most of the time that the Admiral of the fleet was First Sea Lord; he was a keen supporter of his policy; he refused an invitation to join Mr. Lloyd George's Government unless a place was also found for Fisher; and he is now the latter's literary executor. But as to the importance with which Lord Fisher regarded Singapore, there can be no doubt. He it was who said: "Five keys lock up the world—Singapore, the Cape, Alexandria, Gibraltar, Dover. These five keys belong to England, and the five great fleets of England will hold those keys." Up to 1914 it was the North Sea Fleet which absorbed our main effort, to the comparative neglect of the needs of the other fleets, and what we are now obliged to do at Singapore is but a feeble attempt to overtake arrears of work to enable our Eastern Fleet to hold this vital strategic position.—*Army, Navy and Air Force Gazette,* 11 August, 1923.

THE UPKEEP OF WARSHIPS.—First Costs and Maintenance Charges.—Some interesting particulars concerning the cost of naval construction in the present day and the annual expenditure on the upkeep of the newest types of war vessels are contained in a statement prepared in reply to a

question in Parliament. The Financial Secretary of the Admiralty states that the cost of a battleship of the latest type, inclusive of torpedoes, ammunition, etc., is estimated at about £7,000,000. Of this approximately £3,200,000 is due to labor and £2,100,000 to material, the remainder being due to profit and a proportionate share of establishment charges other than labor and material, such as rent, rates, maintenance, etc. The cost of a battle cruiser of the latest type is approximately £6,450,000, of which about £2,900,00 is due to labor and £1,950,000 to material. Corresponding figures for a light cruiser of the latest type are £1,770,000, £800,000, and £530,000 respectively; for a destroyer £275,000, £125,000 and £80,000 respectively; and for a submarine £430,000, £195,000 and £130,000 respectively. The attached table gives the approximate annual cost of the various classes of ships in full commission in home waters at present prices:

	Battleship*	Battle Cruiser	Light Cruiser	Destroyer	Submarine
	Nelson £	*Hood* £	*Hawkins* £	*W Class* £	*K Class* £
Full pay, marriage and other allowances, National Health Insurance and Unemployment Insurance	217,600	189,500	108,400	18,500	14,000
Victualling, clothing and mess gear	75,400	63,400	37,600	6,400	3,000
Medical stores, etc	740	630	370	70	30
Miscellaneous effective services	4,460	3,760	2,220	380	170
Fuel and lubricating oil	28,600‡	54,500	30,000	5,100	3,300
Sea stores	14,800‡	22,000	7,000	1,600	250
Repairs	26,000	28,000	18,000	4,000	17,000†
Armament stores, etc	67,850	37,930	13,940	2,940	950
TOTAL DIRECT CHARGES	435,450	399,720	217,530	38,990	38,700
Liability in respect of retired pay and pensions	58,200	53,450	31,900	5,400	3,050
GRAND TOTAL	493,650	453,170	249,430	44,390	41,750

*Under construction.
†Including renewals and portions of batteries.
‡Estimated cost.

—*Army, Navy and Air Force Gazette*, 18 August, 1923.

POLITICS AND ARMAMENTS.—Although politics are not the *métier* of this journal, it is impossible to ignore the somewhat strained relations between the Government of this country and that of France over the question of the German reparations. In comments upon the latest published official correspondence on this subject, the British Government is urged to act. One paper says that "if Great Britain is to act she must act quickly, for her own sake and for the sake of Europe." When action comes into the question the interest of the Services is at once aroused, and the point is, against whom should action be directed? Presumably it is against our late Allies. The only directions in which it would seem that action can be taken are to indicate to the French and Belgians that they should withdraw from the Ruhr, or to demand payment of the money they owe us. In the last resort this means war.

Instead of searching the pockets of the Germans, with the aid of the French and Belgians, we have agreed to pay the United States a large annual sum which has considerably reduced our ability to provide the forces required to exert pressure. Professor J. M. Keynes says that we shall be paying to the United States each year for sixty years a sum equivalent to two-thirds the cost of our Navy, and more than the total profits of our merchantile marine and our mines together. While thus handicapped, it should be recalled that the nation we are urged to bring

pressure upon has at the present time the largest Army and best-equipped Air Force in the world. Our Navy is, it is true, considerably stronger than that of France, but it is a defense force, and just at the present juncture has been deprived by a late compromise of the control of the Air Force which it requires for efficiency. It is true this is not a definite conclusion, but is to be reconsidered after discussion in the House of Commons in the autumn. To make the Army and the Air Force effective, too, there is still much to be desired. Taking a wide view, it seems in the circumstances rather unwise to talk about "action." Still less expedient does it seem at this time to talk about reducing the pay of the defensive forces.—*Army, Navy and Air Force Gazette,* 18 August, 1923.

Sperigyro Ship Stabilizer for British Admiralty.—The British Admiralty have recently taken delivery of a Sperigyro ship stabilizer of 78-in. diameter by 17.5-in. face, weighing 18,500 lb., which will be driven at a speed of 1,500 r.p.m. The apparatus was constructed by Messrs. Metropolitan Vickers Electrical Company, Limited, to the patented design and specification of the Sperry Gyroscope Company, Limited, London. The stabilizer is already installed and the result of the trial will be watched with considerable interest.—*Engineering,* 17 August, 1923.

FRANCE

Is France Anxious about the Singapore Base?—The Paris Government, in solemnly ratifying the Washington agreement stated two things: viz., that it in no way considered the battleship ratio as classifying navies, and that France would consent to no further limitations concerning other types of vessels. On the occasion of the launch of the *Duguay-Trouin* President Millerand and Minister Raiberti both affirmed the will of France to retain a first-class Navy—words, but acts also. Never before has war preparation been more strenuous. Gun, torpedo, anti-aerial, and submarine exercises are continuous in the Channel and Middle Sea, while on shore naval laboratories and testing grounds are experimenting with a series of new fighting appliances and devices, and the naval aerial wing is flapping as never before. The two ex-German dirigibles are cruising over the Mediterranean, seaplane divisions are conducting endurance tests round France, and a new aerial base is being created near Toulon.

The rumor which represents France as being displeased by British preparations at Singapore and as strengthening her forces in the Far East is contrary to facts and even ridiculous. It shows ignorance of France's situation and policy. British maritime supremacy France neither questions nor challenges: it is an accepted fact, and it is safe to say the majority of Frenchmen prefer that the trident of Neptune should not change hands. Should things come to the worst and Boche propaganda succeed in estranging Great Britain and France, *pour le plus grand benéfice et la plus grande gloire du Roi de Prusse,* France's defensive arguments would be in the air rather than at sea, and it is in Europe that French colonies would be defended, all the more as it is patent to all colonial experts that the loss of Indo-China would sound the knell of the great British Asiatic empire. In the colonial field, just as in Europe, France and England have tied interests, and they play into the hands of their common enemies if they quarrel. So much for logic and reason; but there are telling facts: the Saigon arsenal is to lose its naval character and to become purely commercial under civilian control. As to the French naval division in the Far East, it includes only two units worth mentioning, and they are lame ducks: viz., the small scout *Colmar* and the sloop *Craonne,* of 800 tons.

As to the Frochot cruiser division, including the *Ferry* (flagship), *Hugo*

and *Michelet* (or perhaps only two of these), it is not intended for the Far East, but for flag-showing duties in the Atlantic. It is bound on commercial business and also diplomatic: viz., to keep in touch with our colonies and with nations friendly to France, to show to the world that the French Navy, though in modest attire, is yet alive. At the same time, this second world cruise will be a splendid school for seamanship, all the more so as new crews are being embarked in the *croiseurs cuirassés,* and also new staffs. Ocean warfare may any day confront France for the defense of her colonies; therefore it is important that French officers should have personal acquaintance with navigation in distant seas, and be at home when in command of fast cruisers or submarines in the Atlantic, Indian, or Pacific Oceans.

As to the three 12,600-ton *croiseurs cuirassés* protecting Indo-China, it is an obsolete idea. While being good for peace duties, they are lamentably out-of-date and unfit for fighting on the high seas, although they could more than hold their own against any post-war cruiser that would be good enough to wait for them. The finest post-war cruisers afloat—the 10,000-ton *Hawkins* of the British Navy—are faster by some ten knots, and are, of course, infinitely superior for cruiser warfare on the ocean. On the other hand, a *Hawkins* (seven 7.5-inch guns behind shields) would be no match for a *Ferry* (four 7.6-inch guns and sixteen of 6.5 enclosed in armored turrents). As a matter of fact, many officers are of opinion that the Washington Agreement limiting to 10,000 tons cruiser displacement will have for effect to preserve for some time to come some value to the four *Ferrys* and to the two *Quinets.* These latter six-tunnelled *croiseurs-cuirassés,* that displace 14,000 tons, are good yet for 21 knots (22 for the *Quinet*), and mount fourteen long-caliber 7.6-inch weapons under 6-inch armor. No cruiser of 10,000 tons and over 30 knots can be made to be a match for them in ballistic power and armor protection. At the same time there are two shades in that optimistic picture: viz., the *Quinets* would fall an easy prey to any modern battleship, and therefore are of little use in European seas; and, secondly, they absorb too large a personnel for their worth.

The 18,350-ton *Voltaire,* launched in 1909, is to be thoroughly refitted and modernized at Lorient at heavy cost, the work to last six months up to March next, when she will hoist the pennant, a new ship in several respects. The wisdom, in these times of 35,000-ton mastodons, of spending so much in patching up a battleship of a totally obsolete type may well be questioned; and with bitter sarcasm naval observers note that the sums invested in the refit of so many worthless pre-war *cuirassés* and *croiseurs cuirassés* would have been sufficient to complete the 25,300-ton quadruple-turret *Normande* and *Flandre,* the fighting value of which nobody doubted, and the hulls and motors of which have just been sold for paltry amounts.

On the other hand, the Admiralty policy in this respect has a few defenders. The Germans, it is pointed out, have by no means given up their former naval ambitions: silently and patiently they are paving the way for a prompt naval revival, of course doing much secretly, Boche fashion, and preparing surprises for "The Day," but openly also utilizing the matériel the treaty left them, and improving it for the training of their one hundred thousand naval reservists. French authorities, who ever see war looming over the horizon, and who have reasons to entertain that belief, want to be able to meet single-handed and to defeat whatever forces the Boche-Bolshevists could bring into the Channel. The 13,000-ton *Braunschweigs* of Bocheland (four guns of 11-inch and fourteen of 6.7) are known to have been rearmed and skilfully modernized in several ways, and at short range six of them might be a match for the three 18,000-ton *Voltaires.* Hence the importance of strengthening the fighting value of the

latter—all the more so as the recent maneuvers have shown the possibility of a bold armored force, under poor conditions of visibility such as often prevail in the Channel, effecting *coups-de-main* against the French coast and eluding the search and pursuit of Gallic torpedo craft.

Moreover, strange as the thing might appear, the contention is often heard in Paris naval circles that the *Voltaire* type, even in the light of war lessons, is not so obsolete as it looks to those superficially-minded people who accept ready-made opinions. The one uncontested lesson of Jutland is the superlative effectiveness of volume of fire; to a certain extent it was the triumph of the 11-inch caliber. Now the *Voltaire* mounts four 12-inch (440-kilo shells) and twelve 9.4-inch weapons (220 kilos), with high command of fire and well protected in thick twin turrets. The French 9.4-inch shell is superior to the 9.2-inch projectile as supplied to the British *Warspite-Shannon* class; and there is, further, the idea that post-war battleships, especially those built under the Washington Agreement, will only be thinly protected on the waterline owing to the amount of armor needed to ensure effective defense against vertical hits. Thus 12-inch and even 9.4-inch could have a say under favorable conditions.

But could a *Voltaire* withstand 15 and 16-inch shells? In a certain measure she could, answer her partisans (if enemy shells were to strike her armor where it is thickest, no doubt); and, as to torpedoes, the three remaining *Voltaires*, with their longitudinal bulkheads and wide caisson (considerably improved since the torpedoing of the *Danton*), are in a better position to withstand under-water explosions than most Dreadnaughts and super-Dreadnaughts now in service. It has even been proposed by sacrificing two knots in the speed (which is 19 knots), to render the *Voltaire* quite unsinkable by the addition of an outer bulge to her inner *caisson*. In this way the three 18,000-ton *cuirassés* would form a monitor division of 16 knots and of great power. Another proposal is to discard the 9.4-inch armament and to fit instead 13.4-inch weapons. It has been estimated that the *Voltaire* could carry eight guns of 13.4-inch.

Useless to say, most experts consider the expenditure projected in the *Voltaires* as sheer waste and as a sign of incoherent policy. Aerial defense is generally considered as sufficient to ensure command of the Channel.

There are signs that the Paris Admiralty intends gradually strengthening the submarine force. A "section *des armes sousmarines*" will be created at the Admiralty to look after the training and utilization of submarine specialists, whilst the Toulon submarine schools (personnel, motor, and torpedo branches) are to be given new developments. Six new submarines have just been ordered at private yards (Hâvre, Nantes, Chalon-sur-Saône). Intended for coastal defense, they will displace 600 tons when submerged, and 770 when on the surface, with 14 knots speed, seven torpedo-tubes of 22-inch diameter, and a 4-inch quickfirer. With their twenty per cent buoyancy, good habitability, and powerful torpedoes they are considered ideal defensive boats. No fewer than twenty-one up-to-date submarines are now in hand, representing a fine force.—J. B. Gautreau in *Naval and Military Record*, 29 August, 1923.

MINISTER RAIBERTI ON NAVAL POLICY.—In a recent discourse at St. Malo, Minister Raiberti strongly asserted his firm belief in the great future of the French Navy. France had victoriously withstood the greatest trials of any nation: her Navy, that was part of the very life and blood of the French nation, would successfully emerge from the present crisis resulting from the war and its ruin and devastation, resulting also from the generous sacrifices France had made for the Allied cause. With the cruiser *Duguay-Trouin* completing at Brest a new French Fleet was beginning to come to life that embodied the lessons of the war, that would possess speed and

radius of action, together with up-to-date long-range weapons, and be able to efficiently protect French colonies. *Sans marine pas de colonies!* He announced his intention to ask Parliament for permission to lay down the six remaining cruisers of the program that would realize the highest power allowed for by the Washington Treaty.

An aeronautical program would shortly be submitted to Parliament with a view to making the French coast unassailable. Not conquest, not the bullying of others, but peace and security was the aim of France. M. Raiberti concluded by affirming that both Parliament and the Government were alive to the value of "continuity of efforts in the development of sea power." M. Raiberti has been in charge of the Navy for the last nineteen months, and Admiral Grasset for over three years has acted as First Sea Lord, which means some progress in the matter of stability. Besides, Premier Poincaré is very highly respected; and he has every chance to remain in power up to the time when the Ruhr question has been settled in conformity with treaty rights.

The new 8,000-ton *Duguay-Trouin* is, up-to-date, the finest cruiser on the water. Laid down at Brest on August 4, 1922, she has been launched in an advanced state of completion, and, as her boilers and armament are ready, she could be completed at a fast rate. There are signs that Britanny arsenals are anew coming up to their pre-war standard. In the matter of speed and artillery protection the new *croiseur léger* has no rivals. The eight small-tube oil-fuelled boilers and geared Parsons turbines will produce from 110,000 to 120,000 h.p., and 36 knots are expected, the design of the water-line being the embodiment of secret data acquired from a series of tank and sea experiments. The twin turrets make up for the relatively low caliber of the main artillery, which is deplored by many officers, but it is confidently stated that the 155mil. guns of the *Duguay-Trouin* will be a match for most 7.5 and 8-inch weapons afloat, having a range of 25,000 meters and improved shells endowed with both chemical effects and penetrating power. All the same a heavier armament is being prepared for the next cruisers.

The actual controversy among French naval men is about the rank of the *Duguay-Trouin*. In *Ecole Navale* treatises Suffren is considered, if not as *les plus grand homme de mer de tous les temps*, at least as a rival worthy of the great Nelson. In any Navy there never was a leader more anxious to fight and more disdainful of odds, as testified by his dash against Johnstone at La Praya and by his determined attacks against the stubborn Hughes. On the other hand, Duguay Trouin did a good deal more fighting than Suffren, and was just as enterprising and daring, with a touch of lion-like personal bravery often displayed in fearful boarding onslaughts.

French Army and Navy men are, on paper, fighting anew the Great War for the purpose of finding the mistakes that were made—and they were many and extremely costly, especially on land. This fact is shown in a conclusive manner by the excellent essay published by Commandant Grasset. In *Neufchâteau* (just out at Berger-Levrault, Editors, Paris) he tells us, hourly, even minute by minute, what happened to a colonial brigade that was bravely pushing forward through Belgium, with the orders *Engager l' ennemi partout où on le rencontrera*, and unexpectedly dashed against a full Prussian army corps—a whole-day fight of 6,000 French against 28,000 Boches. Poor scouting and too much dash! A similar tale could be told of many brave British regiments marching against the Boches in August, 1914.—J. B. Gautreau in *Naval and Military Record*, 22 August, 1923.

FRENCH NAVAL POWER.—With the launch of the light cruiser *Duguay-Trouin* at Brest last week the reconstruction of the French Navy may be said to have begun in earnest. As M. Raiberti, the Minister of Marine, remarked in the course of his speech on this occasion, France is a great colonial Empire, and history has shown it to be impossible to maintain overseas possessions without the aid of a strong fleet. But it is not only for the protection of her valuable territories in Africa, India, and Asia that France requires a powerful navy. She has a European coastline of two thousand miles to defend, a task rendered peculiarly difficult by the fact that this sea-board is not continuous. Even in the present era of swift movement at sea a fleet in the Mediterranean might not be able to arrive in time to prevent an invasion of the northern coast, and vice-versa. During those first fateful days of August, 1914, before Great Britain drew the sword, there was nothing but a squadron of old French cruisers to oppose the German High Sea Fleet. The bulk of the French Fleet was in the Mediterranean, guarding the vital lines of communication with Africa, and not a ship could be spared from that duty. The Northern Squadron had orders to resist to the last, but it could not have delayed the German Fleet for an hour. Its destruction would have left the enemy free to land an army on the Cotentin peninsula, thus outflanking the French military front and, in all likelihood, bringing the war to a speedy termination. This disaster was averted by the intervention of the British Fleet, but it is now known that the German naval staff had everything prepared for a swift and overwhelming descent on the northern coast of France. Nothing could have prevented the success of this coup had Britain remained neutral.

MASTERY OF THE MEDITERRANEAN.—France took the lesson to heart, and is now resolved to maintain a navy of sufficient strength to guard both her coasts. Battleships, it is argued, are not indispensable for this purpose. Under modern conditions the functions of coast defense can be adequately performed by light-craft, submarines, and aeroplanes in co-operation with shore batteries, as is held to have been demonstrated by the recent maneuvers in the Channel. Cruising ships of great speed are needed, however, both as a support for the smaller units of the coast defense organization and as a threat to the enemy's communications. The design of the *Duguay-Trouin* clearly indicates the trend of French naval thought at the present time. In this ship and her two sisters, *Lamotte-Picquet* and *Primaguet*, fighting power has been largely sacrificed to velocity. The armament of eight 15.5 cm. guns is exceedingly light for a ship of 8,000 tons, and armor protection is reported to be of the scantiest. But against this weakness in offensive and defensive power must be set a speed for nearly forty miles an hour, which makes the three ships in question the fastest of their type in the world. Under the second half of the naval program six additional cruisers are to be built, of increased displacement, higher speed, and heavier armament. A large fleet of destroyers and submarines is also provided for. When all this new material is completed some years hence France should be in a position to dominate the Mediterranean, for in view of the growing power of underwater and aerial weapons there appears to be little scope for the capital ship in those waters. In spite of apprehensions expressed by Paris naval critics, Italy is not, and probably never will be, a serious rival to France in the maritime sphere, as in the long run naval power is as much a matter of potential resources as of existing material, and France has an undoubted advantage in both respects.

POLICY AND ARMAMENTS.—Although it is a pure coincidence that the first important units of the new French Navy should be going afloat at

a time when our relations with that country are less cordial than they have been for years past, the fact suggests food for thought. British armament policy since the war has been based on the assumption that the *entente cordiale* would continue. But if France and Britain are destined to drift apart it will obviously be necessary for us to reconsider our defensive requirements. So long as France remains our friend we can afford to look with equanimity on her matchless army, her supreme air fleet, and her growing naval force, secure in the knowledge that these powerful weapons are not aimed against us. Unfortunately, however, the existence of the entente is being seriously threatened by disputes arising out of the reparations problem. We would remind our pacifists, who are doing their best to embitter Anglo-French relations, that they are going the right way to make a new competition in armaments inevitable. If France is to be regarded as a potential enemy we must lose no time in strengthening our combatant forces by sea, land, and air. With such a contingency in view it would not be enough to adopt the one-Power standard in air strength alone. We should require large additions to the Navy, involving a great building program of cruisers, destroyers, etc., together with a considerable expansion of the personnel, while the Army would have to be increased to at least twice its present dimensions. This fact, obvious as it is, seems to have escaped the attention of those who are loudest in demanding a definite break with France, but it is time that the British people realized the grave consequences of such a development. To the majority of the nation the thought of arming against France is, we believe, utterly repugnant. Nevertheless, it will have to be done if the entente comes to grief. Meanwhile, it would be comforting to have an assurance from the politicians and journalists who are leading the anti-French campaign that they will support any program of rearmament which may be necessary to enable this country to defy French resentment.—*Naval and Military Record*, 22 August, 1923.

New Cruiser Type.—The same policy of keeping open the Mediterranean route is also partly responsible for the new type of fast unprotected cruiser, of which three are being built under the names of the *Duguay-Trouin*, *La Motte-Piquet* and *Primauguet*. The first was launched at Brest last week. It was also the first vessel launched under the new naval program. Work was started upon it exactly a year ago, and the Minister of Marine was able to point to this as a proof of the rapidity with which ships can be constructed in the arsenals. The propaganda in favor of transferring the construction of war vessels from the arsenals to private shipyards has, apparently, produced a good effect. The *Duguay-Trouin*, like her sister ships, has a displacement of 8,000 tons, and the latest published figures of her dimensions are length 175 m., beam 17.20 m., and draught 5.30 m. She will have four propellers driven by geared turbines. There will be eight oil-fired generators, and the power developed will be 100,000 horsepower. The speed is to be 34 knots. The armament will consist of eight quick-firing guns of 155 mm., placed in pairs in armored turrets, four anti-aircraft guns and four torpedo tubes of 550 mm.—*The Engineer*, 24 August, 1923.

Refloating the "France."—When a year ago the battleship *France* struck an uncharted rock in the Quiberon Bay and sank in a depth of water that left its side a few feet above the surface at low tide, all idea of refloating it for reconditioning was abandoned. The currents in the channel are extremely violent, and the difference between high and low water level is from 18ft. to 20ft. The Admiralty desired to recover the guns and other objects of military value. The only way of doing this was

to refloat the battleship, which, however, could not be done by the usual means, such as were employed to refloat the *Leonardo di Vinci*. On account of the currents and the tides a compressed air plant and repair equipment to make the hull water-tight could not be employed from a separate vessel, and it was only recently that the Admiralty accepted a tender from two Paris engineers, M. Alfred Pasquet and Colonel Henri Bons, to raise the battleship by a new patented method. On the hull of the battleship emerging from the surface at low tide will be fixed five vertical tubes, each 3 m. in diameter and 15 m. high. These five tubes will support a bridge 10 m. wide which will be fitted with the entire equipment necessary for the work, together with all stores, cranes, wireless, lifeboats, and lodgings for the engineers and men so that the work can be carried on continuously in all weathers. At the top of each tube will be an air lock to allow of the men descending into the hull. It is expected that the installation on the hull will be completed in about three months, and the contractors hope to refloat the *France* in from one year to eighteen months.—*The Engineer*, 24 August, 1923.

FRENCH AERONAUTICAL NOTES.—The French aircraft industry can manufacture in time of peace 6,000 planes per year; of these, last year 380 were manufactured for commercial use and 200 were exported. This number can be about doubled in time of war.

By October, 1922, 383 commercial airplanes had been registered in France as owned by companies or individuals. The relative growth in military and commercial aviation finds an interesting illustration in the percentages of these two types shown at the exhibitions since 1919. In that year military planes composed twenty-five per cent of the exhibit and commercial planes twelve per cent; in 1921 the ratio was thirty-five per cent and nineteen per cent, respectively; in 1923 the military made up forty-three per cent and the commercial thirteen and four tenths per cent.

The "Société de Propagande Aéronautique" propose to make a propaganda for the use of the airplane in France, and later in other parts of Europe. Their purpose is to familiarize the public with the airplane as an object of everyday life which is to be used as are other means of transportation, to show that it is not more dangerous, and is a comfortable and convenient means of travel and thus to encourage the sale of planes and improve commercial connections.

The position held by France in developing the science of aviation, particularly in the field of commercial flying, is being aided and sustained by the great number of prizes offered for 1923 on the part of government, cities, clubs, and private concerns, Vice Consul T. B. Dawson, Paris, reports to the Department of Commerce. The money prizes alone from all sources to date total 4,262,000 francs. The prizes offered are for all types of aircraft and aero engines.

The French civil aviation budget for the year 1923 is F.138,443,350. Of this sum F.41,422,000 is set aside for subsidizing approved commercial air services, F.3,000,000 for aviation companies operating refresher courses for reserve pilots, F.1,000,000 for propaganda, F.922,000 for premiums to tourist airplanes and F.173,000 for subsidies to technical schools of aeronautics.—*Aviation*, 20 August, 1923.

GERMANY

EARLY GERMAN WAR PREDICTED BY LUDENDORFF.—Nuremburg, Germany, September 2 (Special Cable).—"The German people are ready to rise in a war of liberation. To talk of a putsch or Bavarian separation at this moment is sheer nonsense. The half-million men here are those who will free Germany from French oppression.

"When? Not today; not tomorrow, but soon."

In these words General Ludendorff in an interview interpreted the significance of the military. monarchistic demonstrations today in this mediæval city in commemoration of the Prussian victory at Sedan.

Given Ovation by Fascisti

While he spoke thousands of Fascisti clamored outside the Furstenhof Hotel and General Ludendorff was compelled to halt his conversation no fewer than six times to go out on the balcony and bow to the plaudits. He was dressed in the full regalia of a field marshal. Around him stood officers of Captain Erhardt's corps. This organization is under the ban of the Government, but its leaders are the heroes of the Monarchists. They were in the uniforms of the old Death's-Head Hussars.

Half an hour before General Ludendorff, in an automobile, headed a procession with other military leaders and members of the old imperial royal family.

Loving Cup To "His Majesty"

Just before the demonstrations began he gave a silver cup of wine to Prince Hans George von Schoenach-Carolath, son of Princess Hermine, with the words "for your Majesty." It is common knowledge that Ludendorff does not want the Hohenzollerns back, but that if his "moment" comes the throne will go this eldest son of the former Kaiser's new wife.

Apparently, the 500,000 men are ready for action, but the leaders are not agreed on the advisability of it. All preparations are being made for the Monarchists to leave the city, and then, it is said, Socialists will stage a counter-demonstration.

All the leaders today spoke publicly of a war of liberation. But no... indicated that the exact moment has arrived. A union of Nationalists and Fascisti seems to have been accomplished, but the time is not yet deemed ripe.

Funds For Guns Lacking

The question of money and how to get it from big business is occupying the minds of the leaders. Manpower for war is here. That is evident from the remarkable discipline of the volunteers and their fanatic enthusiasm. But guns mean money and money is in the hands of big business. Apparently the industrialists have not agreed to give it up, hoping to get what they want by bargaining with the French and without spending so much.

The only disturbances of the demonstrations took place last night when twenty Socialists attacked a group of Fascisti. One of the latter and two of the attackers were hurt, the Socialists seriously. The wounded Fascisti immediately became the hero of the hour.

Adolph Hitler, the Fascisti leader, addressed big crowds this evening. He talked of resistance to the end and ridiculed the Stresemann Government.

"Will Trample Poincare"

The songs sung by the paraders in the Sedan victory parade included "Deutschland Über Alles" and "Victoriously We Will Conquer France." The streets were decorated with imperial flags and crowds scattered roses on the marching troops.

These did not appear to be volunteers recruited from a defeated army, but, as Ludendorff put it, to me "a new army born in our days of darkness."

"What you have seen—these fine, sturdy soldiers, these old officers, these new officers—are the liberators of Germany," he went on. "We have shown the outside world Germany is not defeated. Her time is coming. We will not suffer the disruption of the Reich.

"We will have a united Germany with us. As we overthrew Louis Napoleon fifty-three years ago so will we trample Poincaré. German manhood is ready."—(Copyright, 1923, by the New York *World.*)

STRESEMANN ASKS RESTORED SOVEREIGNTY IN RUHR AREA.—Stuttgart, Germany, Sept. 2.—Designating the restoration of German sovereignty and German administrative authority in the Ruhr and the Rhineland as a fundamental condition under which Germany is prepared to resume the payment of reparations, Chancellor Stresemann, addressing a gathering of leaders of industry, finance and labor here today, declared the Government and nation were prepared to assume economic material burdens in order to receive the liberation of the invaded areas.

"Passive resistance will cease," said the Chancellor, "when Germany is given assurance that the present conflict in the Ruhr and the Rhineland will be solved on the basis of the productive economic pawn pledged by Germany. We are prepared to make heavy material sacrifices, but are not willing to surrender to anyone the freedom of German soil."—Baltimore *Sun,* 3 September, 1923.

A RUSSO-GERMAN WAR PLOT?—A sensational account of the alleged growth of a German military influence in Russia was published by the *Morning Post* on Thursday. A Petrograd correspondent was quoted as saying that Germany has evidently decided to restore her military might on Russian territory. "It is no longer a secret in the Soviet Republic that the Germans have undertaken the complete re-equipment of the Red Army, and it is stated that tanks, aeroplanes, and other equipment are arriving daily at the port of Petrograd, manifested as agricultural machinery." If all this war material is really coming from Germany, it would be interesting to know how and where it has been manufactured. Allied control officers are still active, and it is not easy to believe that the wholesale production of such bulky war equipment as tanks, aeroplanes, and the like could be hidden from them. Circumstantial but inherently improbable details of this kind tend to cast suspicion on the whole story of a Russo-German military conspiracy, though we are far from asserting that it lacks every substance of truth. The *Morning Post* correspondent adds that the Russian air service and chemical warfare section is now entirely in the hands of Germans, who also swarm in the munition factories and the Red Navy. It seems to us that statements of so grave a character ought not to pass unremarked. If they are true it should not be difficult to collect positive evidence to that effect. If Germany is really building up a new war machine on Russian soil, the facts, supported by testimony beyond challenge, ought to be made known to the whole world, which has a common interest in preventing any revival of Prussian militarism.—*Naval and Military Record,* 22 August, 1923.

JAPAN

DEFEND JAPAN'S GOOD FAITH AS TO TREATIES.—On August 17 the four-power Pacific treaty and the five-power naval treaty concluded at the Washington Conference were at last signed and the ratifications thereof duly exchanged at the State Department by the representatives of the signatory powers. This belated event has relieved Japan of the uneasiness with which she had waited for it. So apprehensive was she at times that some of her naval men suggested a short while ago that England, the United States and Japan enter into a separate agreement, making the Washington treaties effective without awaiting French ratification.

Although Japan believed, rightly or mistakenly, that the Washington Conference was called to curb her growing naval power and her ascendency

on the Asian continent, she has proved a very willing observer, certainly the most prompt approver, of the treaties resulting therefrom. The conference ended on February 6, 1922, and Japan ratified all the treaties within ten weeks, as follows: Four-power Pacific Treaty, April 8; five-power naval treaty, April 12; nine-power treaty concerning China, April 17; nine-power treaty concerning China's customs tariff, April 6; five-power treaty concerning the use of submarines and poison gas, April 17; Shantung Treaty, April 4, and Yap Treaty, April 4.

Japan ratified these treaties without reservation or "understanding" or "interpretation." The ratification was as unconditional as it was prompt. Nor was the approval merely on paper, but it was followed by acts leaving no room to doubt Japan's earnestness in welcoming the agreements.

Confining our observation to the naval treaty, which is unquestionably the most important of the Washington agreements, Japan was the first to put its provisions into execution. She did not resort to the Fabian policy of "wait and see." She trusted the good faith of other signatories, and commenced the process of naval deletion without waiting for the ratification or final signing of the treaty by other powers.

On August 16, last year, the Japanese Navy began removing the turrets of the main batteries of the *Katori, Kashima, Kurama* and *Ikoma.* The scrapping of the *Hizen, Mikasa, Satsuma, Aki, Settsu* and *Ibuki* was also commenced. Nor was the scrapping confined to older ships, for the Japanese Navy undertook at the same time the scrapping of the four most up-to-date dreadnaughts, the *Kaga, Tosa, Takawo* and *Atago,* all of which had been launched just before the Washington Conference.

This prompt action caused much adverse criticism at the time. What if France or Italy failed to ratify the treaty? Suppose other signatory or signatories adopted reservations of a nature to curb the effectiveness of the agreement, would not Japan be acting too rashly in deleting her navy without making sure what others would do?

In spite of such apprehensions Japan went ahead with her own plan. She adopted a year ago a program for the retirement of 949 naval officers, 415 warrant officers, 2,345 petty officers and 8,446 men—a total of 12,155. This amounts to a reduction of 15.7 per cent in the personnel of the navy. Meanwhile enrollment in the Naval Academy was reduced to fifty last summer from about 300, the number admitted annually before the reduction.

In 1920 Japan adopted a naval building program known as the 8-8 program. As far as the building of dreadnaughts was concerned this program was made obsolete by the Washington Treaty. As to auxiliary ships the plan included twenty-six cruisers, ninety-four destroyers and ninety-three submarines. Of these projected ships seventeen cruisers, fifty-seven destroyers and forty-seven submarines had already been completed or under construction before the Washington Conference. This left nine cruisers, thirty-seven destroyers and forty-six submarines yet to be constructed when the conference was called. Had Japan gone ahead and built all of these ships after the conference she would have been above reproach, because the Washington naval treaty placed no restriction upon the building of auxiliary ships.

But Japan looked at the treaty in the light not of its letter but of its spirit, and decided upon as radical a curtailment of the building program of auxiliary vessels as the reduction of capital ships. As the result of this decision Japan is to build eight cruisers instead of original nine, twenty-four destroyers instead of original thirty-seven, and twenty-two submarines instead of original forty-six.

Of the eight cruisers, four are to be 10,000 tons each and the remaining four 7,000 each. The total tonnage of the twenty-four destroyers will be

33,600, while the twenty-two submarines will aggregate 28,166 tons. The total tonnage reduction amounts to 13,395, as compared with the auxiliary ship-building plan of the 8-8 program.

All these facts are fully appreciated by the American naval authorities, who are, I am certain, convinced with the sincerity of the Japanese Government in observing the spirit and letter of the Washington Treaty. And yet men are not lacking who would impute motives to Japan's acts, misconstrue her good intentions, and generally discredit and belittle what has been done by the Japanese Navy.

They say that the Washington Naval Treaty would have the effect of enabling the Japanese Navy to conduct an offensive naval war in the Eastern Pacific—that is, in America's home waters, while the American Navy, as a result of that treaty, would be incapable of conducting a similar war in the Western Pacific. In the event of an American-Japanese War, they say, Japan would, at the first flash of battle, reduce the Philippines, capture Guam, and eventually invade Hawaii and attack the Pacific coast.

Such insinuations, allegations, and irresponsible assertions have been repeated so often that one is impelled to wonder whether they are a part of an organized effort to estrange Japan and the United States. It is also significant that they come from sources other than American. One must admit that there are nations which would greatly profit should Japan and America fall out. A weakened America or a ruined Japan would unquestionably open a field which might be profitably utilized by other powers.

The main object of the Washington Conference was to eliminate mutual suspicion from international relations. That object has, to no small extent, been attained by the honesty and frankness of the men who represented the powers at the conference. Any deliberate attempt to revive the old suspicions is criminal and should be dealt with accordingly.

No man with common sense can believe that the Japanese Navy, whose capital ships have a strength of three as compared with America's five, is capable of crossing the Pacific to deliver anything like an effective attack upon any section of the Pacific coast of America. If the Naval Treaty has made it difficult for the American Navy to undertake an offensive war in the Western Pacific, it has made it far more difficult for Japan to conduct a similar war in the Eastern Pacific.

Thus the treaty has converted both the American and the Japanese Navy into weapons of defense and not instruments of attack. And that was the end which the naval authorities of the two countries had really in view.

Of all insinuations recently directed against Japan none is so absurd as the insinuation that she had before the Washington Conference completed the naval bases and fortifications of the Bonin Islands, thus placing herself in an advantageous position to propose to the other delegations the preservation of the *status quo* of the naval bases and fortifications in the Pacific. To such irresponsible critics my only answer is: "Go to the Bonin Islands and see for yourself if there is a single naval harbor, a single fortification, even a single gun anywhere in the whole group." Authors of such false statements are either fire-eaters or deliberate trouble-makers.

Japan, too, has her fire-eaters and busybodies. These picturesque characters would conjure up a bogie of Anglo-American domination, and work up a mirage of a Russo-German-Japanese-Chinese-Indian *bloc*.

The idea is, of course, worse than foolish. In the first place China would gladly excuse herself from such a combination, for she has very little love to lose upon her aggressive island neighbor. As for Germany and Russia and India, their company can only make Japan more picturesque

than Don Quixote. Surely no responsible Japanese would take any stock in an idea, the realization of which would make his country a laughing stock as well as an outcast before the world.

No, Japan's fixed policy for the present and for any measurable future is to remain on friendly terms with all the civilized powers, and particularly America and Great Britain, both of which she owes so much for what she is today.—K. P. Kawakami in Baltimore *Sun*, 4 September, 1923.

MEMBERS OF JAPAN'S "EARTHQUAKE" CABINET.—The appointment of Admiral Count Yamamoto Gombei as Premier comes as something of a surprise. Not that the naming of a naval officer as head of the Government is an innovation in Japan. Yamamoto himself was Premier from February, 1913, to April, 1914, and his latest predecessor, Admiral Baron Kato, was also an officer of the sea service. But it was precisely on account of the record of the Kato Ministry that the political pundits in Japan had confidently forecast a reversion to civilian control in the next government.

Admiral Kato was a man of unblemished character; in the words of a political opponent, he was "the straightest and most conscientious Prime Minister Japan has ever had." But for all his personal integrity and strong sense of duty he was not a success as political chief. The fact was he hated politics as such, and left the management of them too much in the hands of others.

Until a few months before his demise he combined the duties of Premier and Marine Minister, though the double burden was an intolerable weight on his shoulders and overwork soon aggravated the internal complaint from which he was suffering. It was noticed, however, that he remained to the end far more absorbed in purely naval questions than in problems relating to his higher office. As chief of the navy he was an unqualified success, but as Premier he did not shine. His administration had become highly unpopular in recent months and its downfall at an early date was regarded as a foregone conclusion.

Coincidentally with the decline of the military spirit among the Japanese people—a phenomenon admitted on all sides to be in progress—there has arisen a marked aversion to government by soldiers or sailors, who, whatever their personal attributes may be, are too deeply imbued with the old Samurai doctrine of divine right to rule over the destinies of a people in whom the leaven of democracy is working so strongly. That is why the late Admiral Kato, despite his personal popularity, failed to make good as Premier.

Japanese liberals have been striving for years past to abolish the privilege enjoyed by War and Marine Ministers in the Cabinet of appealing direct to the throne over the heads of the Premier and the Diet whenever a controversy affecting their departments crops up. Hitherto these attempts have failed, and they will continue to fail unless the law which inhibits any civilian from representing the Army or the Navy in the Cabinet is abrogated. But when a fighting man is appointed not merely as Army or Marine Minister but as actual head of the Cabinet, all the pernicious consequences which flow from this right of appealing to the throne may be intensified beyond calculation, and, as Mr. Ozaki has often declared, parliamentary government becomes the merest farce.

This, notwithstanding, we now find one naval officer succeeding another as Prime Minister of Japan. A procedure so flatly opposed to the wishes of the articulate section of the Japanese people can hardly make for political tranquillity. Thus, quite apart from the awesome domestic catastrophe which has heralded the advent of the new Cabinet, it begins

its career with the storm signals flying and by all the rules of the game is predestined to speedy dissolution.

Except for his brief and chequered term of office ten years ago, Admiral Yamamoto has had small experience of political life. Born in 1852, the approach of middle age found him still actively employed at sea, and his first shore-going job did not come to him until he was in his forty-third year. Appointed Marine Minister in 1898, he held that post till 1906, thereby gaining renown as the architect of Japan's overwhelming naval triumph in the Russian war.

Yamamoto, in fact, was virtually the creator of the splendid fleet which enabled Togo to smash Muscovite sea power in the Far East. It was due to his energy also that the Japanese battle squadron, after its long and arduous patrol off Port Arthur, was reconditioned and rearmed in time to deal faithfully with Rojestvensky in the Tsushima Strait on that never-to-be-forgotten twenty-seventh of May, 1905.

But in an evil hour Yamamoto, like so many other of Nippon's doughty seamen in modern times, turned his back on blue water and entered the treacherous shoals of political life. Called to the Premiership in 1913, he and his Cabinet soon had to bear the brunt of popular fury aroused by the great naval scandal, which implicated a number of high officials and incidentally taught the outer world that the gentle art of graft could be practiced on a large scale even in the land of Bushido. The nominal cause of the Cabinet's downfall was the Diet's rejection of the Navy bill for 1913-14, but this, in turn, was due to parliamentary indignation at the malpractices in high naval circles exposed by the scandal over warship contracts.

During the last ten years Count Yamamoto has avoided the spotlight, and his views on outstanding political questions of the day are therefore unknown. His appointment, however, is undoubtedly a setback to liberalism, representing as he does the *ancien régime* in Japanese politics.

General Baron Tanaka Giichi, who succeeds General Yamanashi as Minister for War, previously held this post in the Hara and Takahashi Cabinets. It was under his administration that the army was increased to its present formidable strength of twenty-one divisions. As he consistently turned down all suggestions for a reduction in the military budget, his return to office may be taken as proof that the proposed disbanding of six divisions will not be carried into effect in the near future.

Baron Tanaka, as a former Vice-Chief of the General Staff, has more than once had a hand in shaping foreign policies, for it is a well-founded belief in Japan that the external affairs of the empire are largely directed by the General Staff, the Foreign Office being only an ornamental facade. As the new Premier, himself a naval officer, is also retaining the portfolio of Foreign Affairs, it seems but too likely that Japan's foreign policy will henceforth be on militaristic lines.

On the other hand, the inclusion of Baron Goto in the Cabinet may portend the adoption of a more conciliatory attitude toward Russia, for this statesman has been closely associated with the recent movement to reopen diplomatic relations with Moscow, and it was as his guest that M. Joffe, the Soviet envoy in the Far East, visited Tokio this year, ostensibly to recuperate from illness, but actually to sound Japanese opinion on the subject of a political and economic rapprochement between the two countries.

Some brief comment seems desirable on a memorandum which has just been circulated from the Japanese Embassy in London containing details of the Japanese naval program now in hand. The following vessels, this document states, are at present under construction: Cruisers, two of 7,100 tons, five of 5,500 tons, one of 3,100 tons; destroyers, seven

of 1,400 tons, four of 900 tons; submarines, thirteen ("the tonnage of these vessels," says the memorandum, "is not published"); airplane carriers, two (displacement not yet settled); gunboats, four of 338 tons; special service auxiliaries, five.

This makes a total of forty-three naval vessels now building, which tallies almost exactly with figures I have recently given in *The Sun*. The embassy, however, omits all mention of those additional fighting ships which have been authorized for construction as soon as the shipyards are free to undertake the work. They comprise the following: Cruisers, four of 10,000 tons, two of 7,100 tons; destroyers, eighteen of 1,500 tons; submarines, sixteen, all of ocean-going type, with displacements from 1,500 to 2,500 tons; besides an unspecified number of non-combatant auxiliary crafts. All of these ships must be laid down within the next eighteen months or so in order to be completed by 1927, the year by which the program is designed to mature.

When these are included the Japanese building scheme is seen to embrace no less than eighty-three combatant units, or forty more than the embassy's statement might suggest to the uninitiated.

Possibly, however, the operpowering disaster which has befallen the country may lead to some modification of this ambitious shipbuilding project. The cost of making good the damage caused by the earthquake will be staggering, and it is scarcely conceivable that further expenditure on military objects will be sanctioned until considerable progress has been made in restoring the devastated areas of the empire.—Hector C. Bywater in Baltimore *Sun*, 18 September, 1923.

UNITED STATES

Effect of Arms Conference.—To prove that the Arms Conference was a success, it is proposed that the Navy estimates submitted by the department be reduced about $73,000,000.

The Director of the Budget in carrying out the policy suggests that the naval authorities start by striking from the estimates, $28,000,000 to be used in inaugurating the work on the eight light cruisers, six submarines, six river gunboats and for an increase for aviation. The estimates recommended strongly by the General Board for increasing the strength of the Navy by 5,000 men are also to be stricken from the Navy's estimate. But this will not be sufficient to carry out this policy of drastic reduction in the naval budget. The appropriations for fuel must again be reduced to a point where the operations of the fleet will be restricted below the demands of efficiency. There must also be a reduction in the cost of the maintenance of the Navy, not the least of which will be in the appropriations for the Medical Corps. Even the health of the Navy may be endangered by the drastic reductions that are proposed by the Director of the Budget.

These items, it will be observed, have not the remotest relation to the arms agreement. There is nothing in the Naval Treaty that limits the number of cruisers, submarines or river gunboats. Five thousand additional men would not fully man the treaty Navy, it is generally acknowledged.

But certain statesmen who have assumed guardianship of the Republican party are insisting that there shall be a cut in the naval estimates to show by the naval treaty that a great burden has been lifted from the shoulders of the taxpayers of the country. They are not concerned so much about the fate of the Navy as about the results of the next Presidential election. It is not sufficient for their purposes that eventually, if the treaty is maintained, there will be a large saving in the cost of battle-

ships and certain other ships. They must show a striking reduction in the cost of the Navy under the treaty at present.

Attention has frequently been called in these columns to the fact that the reduction in the cost of the Navy growing out of the naval treaty has been exaggerated. A careful estimate made by the Navy Department shows that the cost of battleships which were scrapped under the treaty would have been $394,050,000 when they were in commission. This includes everything except ammunition. There had been expended on this program $96,774,427 when the work was stopped. This would make an apparent saving of $297,275,572.

It is these figures that are being quoted to make a showing of great economy in the naval treaty. But they do not tell the whole story. From this apparent saving, to begin with, at least $70,000,000 should be subtracted. Preliminary estimates fix the cost of settling various contracts and scrapping the ships at $70,000,000. Preliminary estimates usually fall far below the actual cost.

Then there is the estimated costs of modernizing the thirteen older capital ships retained under the treaty, which will not fall below $30,000,000 more. This includes increasing the elevation of the guns, blisters to the under-water body, and strengthening the decks with heavier armor. This will make at least $100,000,000 difference between the apparent saving and actual saving. The delay caused by France will probably increase these estimates, which were made shortly after the conclusion of the Peace Conference. The actual saving cannot exceed $197,275,572; not $297,275,572, as claimed by the treaty supporters.

There are, however, a number of elements in the cost of maintaining the treaty Navy that cannot be estimated, but will nevertheless greatly decrease the saving in capital ship construction. Had the program of the eleven capital ships been completed the majority of the thirteen older ships which came under the treaty would have been scrapped as obsolete or placed out of commission. It is not likely that there would have been any expenditures on these ships more than for mere maintenance.

Under the law, the expenditure on old ships was limited and no attempt would have been made to modernize them. Aside from the cost of modernizing these old ships there will be an increase in the cost of maintaining them over what would be required for the new capital ships if they had been completed.

One hundred fifty million dollars is a liberal estimate of the saving in the construction of capital ships that will result from the naval treaty. Of course, there is a possibility that eventually, through the stopping of battleship construction for a period of time, there will be a saving to this country, although in this saving the United States surrenders the supremacy of the sea which would have come to it through completion of the 1916 program.

The danger of the situation grows out of the apparent desire of the politicians to stop all construction of cruisers and auxiliaries and an expansion of the Air Service. There is no limitation on these except that of 10,000 tons on the cruisers. In this type of ship the other great naval powers have an acknowledged superiority over the American fleet. The American fleet has been deficient not only in light cruisers, but in battle cruisers. Under the treaty the American battle cruisers which were in process of construction will be scrapped or turned into airplane carriers.

It is evident that the preparedness forces are facing a crisis as far as the strength of the Navy is concerned. It develops that a program for this cut in the naval estimates was agreed upon before the late President Harding left for the West. It is not known at this writing whether he approved it.

Acting Secretary Roosevelt made a personal appeal to President Coolidge, in which he showed the disastrous effects of the cut in the naval estimates that have been proposed by the Director of the Budget. He was with the President for over an hour, during which time he went into many details of the naval budget. The net result of the conference was that estimates are being revised with some moderate reductions and will be submitted again when General Lord returns from his vacation in September.

Colonel Roosevelt insisted in his conference with the President that the Director of the Budget is proposing to load onto the Navy over half the $126,000,000 reduction in the entire federal budget. With this reduction, Colonel Roosevelt declared it would be impossible to maintain a treaty Navy.—E. B. Johns in *Army and Navy Journal*, 25 August, 1923.

U. S. Naval Base Plans.—The recently approved general plan for the development of naval bases takes that question out of the realm of local politics and places it upon a broad national basis. Such a step has been needed for years, and the present administration is deserving of much praise for its far-sightedness and constructive wisdom.

It is difficult for the lay mind to appreciate the importance of the element of shore bases in aggregate national naval power. This aspect of sea strength finds expression by the British in a world-wide and incomparable system of great naval bases, from Gibraltar eastward to Singapore, besides numerous lesser bases all over the world. By such means the greatest of navies has been able to exert its strength effectively and promptly in any area where the influence of sea power was needed to sustain the empire.

Where shore facilities do not exist fleets cannot go and operate effectively except for short periods of time. In the regions where adequate and secure shore facilities exist the full potential power represented by the existing ships may be brought to bear permanently.

The cost of one ship expended upon a naval base in a remote area may multiply by ten the number of ships which may be maintained there. In such circumstances it is manifestly cheaper to build a base rather than more ships. Such were the underlying considerations which must have led Great Britain to project a great base at Singapore rather than to meet the new Japanese cruiser program by laying down new keels.

Our naval power has been habitually unbalanced by a dearth of shore facilities. They have been deficient even at our naval heart—the northeast coast of the United States. In the Caribbean, on the western home coast and overseas our naval base facilities have been always woefully inadequate.

The new program, projecting large expenditures over a period of twenty years, is apparently calculated to balance our sea power. The east coast is not to be neglected, but improvements there are to be small compared with projects in the Pacific, where we are much weaker. West coast facilities at present simply cannot support major naval operations. They urgently need building up on a large scale.

The greatest project of all, involving an ultimate expenditure of about $40,000,000, is to be in the Hawaiian Islands, and is more than justified by geographical conditions. Here must be the great assembly point for our main fleet in any naval war in the Pacific—offensive or defensive. These islands are nearly equidistant from our whole vast western coastline, including Alaska.

At Hawaii the fleet will be equally well prepared to go to the defense of Unalaska, Sitka, Puget Sound, San Francisco, Los Angeles or San Diego, whichever may prove to be a hostile main objective. Hawaii also

covers all trans-Pacific approaches to the Panama Canal in the northern hemisphere. Moreover, Hawaii is the only point from which operations of our fleet may be projected for the defense of the Philippines. The position of Hawaii is unique and fully warrants the building of a major naval base there.—*Army and Navy Journal*, 25 August, 1923.

WHERE OUR NAVY IS "RIDICULOUS."—American residents in China might get some grim humor out of the fact that they have a "kindergarten Navy" in Chinese waters, we are told, if their predicament were not so serious. Chinese pirates very properly consider this fleet "ridiculous," and perhaps it is, the Shanghai *China Weekly Review* points out, as long as Americans in China "must rely for protection of their lives and property upon part of the old fleet captured from the Spanish by Admiral Dewey in the Battle of Manila Bay, May 1, 1898." This weekly bitterly deplores the heedlessness of Americans at home on the subject of protection for their fellow citizens in China, and observes:

"The average American school-boy at home is brought up to think that piracy is something belonging to the last century, and average American citizens, especially the ones who live in the rural sections, are accustomed to think that battleships and gunboats are useless extravagances. At least we judge this to be true if we consider the attitude of the typical Middle-Western Congressman and Senator toward the American Navy to be a correct indication of public opinion. That piracy is still an active and pressing problem of the high seas and navigable streams along the China coast, and that there is a very great necessity for strengthening and improving the equipment of the American naval power in China waters, is shown by the fact that within two weeks two American gunboats have been fired upon by Chinese pirates, bandits or hostile soldiers. The first case was that of the U. S. S. *Monocacy*, which was fired upon on July 22 at Chungking as it was escorting a peaceful merchant vessel. The other case was that of the U. S. S. *Pampanga*, on July 14, as it was doing patrol duty on the West River inland from Canton. In both cases the American boats were compelled to return the fire in self-defense and in protection of peaceful American commerce."

Such incidents as the foregoing have become so common in recent years, the *China Weekly Review* goes on to say, that they do not even excite comment among the foreign and Chinese communities in the China coast cities. But unless something is done immediately to stop these outrages, it asserts, American commerce will be driven totally from the navigable streams of China. The thing to do, it is declared, is to improve the American naval patrol force, and we read:

"That China is unable to give protection to the peaceful foreign trade that enters her borders in accordance with treaty rights is manifest to all observers. The chairman of the American Chamber of Commerce of Shanghai at the annual meeting of that body, held on June 29, read a list of recent pirate and bandit outrages against American commerce on the Upper Yangtze River, that sounded as though it might have been a page taken from the experiences of sea captains of the first quarter of the last century. That the report of the chairman of the American Chamber was accurate has been certified to by American naval officers who do patrol duty on the upper reaches of the Yangtze River.

"The report told of constant firing upon American ships by pirates and bandits or soldiers, and there was one case where an American ship was actually boarded, cargo destroyed, and officers roughly handled. This latter case was a result of Chinese junkmen refusing to permit foreign steamships to engage in certain lines of the carrying trade, but

the disastrous results upon American commerce in this important part of China is just the same."

The *China Weekly Review* does not pretend to have complete accurate figures regarding the status of all American naval craft of the China coast, but it does cite, from the report of the Associated American Chamber of Commerce (October 23, 1922), the following information with reference to boats on the Yangtze:

PRESENT FLEET AND DESCRIPTION

Name	*Built*	*Speed*	*Draft*
Elcano	1885	8.5 K	12′ 3″
Quiros	1895	8.5 K	9′ 6″
Villalobos	1896	9.0 K	9′ 10″
Palos	1914	10.0 K	3′ 0″
Monocacy	1914	10.0 K	3′ 0″
Isabel	1917	28.5 K	10′ 9″

"The *Isabel's* only serious defect is inability to operate freely above Hankow, except at moderately high water. The *Palos* and *Monocacy* (the only two boats that can go above Ichang, where there should be at least four) have not sufficient speed and power to breast the rapids at high water, much less to escort merchant vessels. Due to defects in design they must stop after four hours' steaming to clean fires and eject ashes. They would be very satisfactory for service below Ichang at such places as Tungting and Poyang Lakes, the Han and other smaller streams at high water, etc., but they are all we have for service up river, and must be kept there.

"The *Elcano, Villalobos,* and *Quiros* are utterly useless. They have no speed and can only move at high water, at which time they proceed to their winter stations, where, when the water falls, they are usually stuck in the mud. It recently took the *Quiros* seven days, steaming at full speed from daylight to dark, to go from Hankow to Ichang. In short, unless trouble occurs at spots where gunboats are stationed, there is vacant hope for any of our gunboats ever getting to the scene, except at high-water season."

This Shanghai weekly complains of the fact that American citizens in China—missionaries perhaps more than business men, because the missionaries live so far in the interior—must depend for their protection upon "such a disgraceful outfit" as the American Navy maintains in Chinese waters, and it avers that:

"The fault, of course, rests with Congress, for American organizations in China, as well as American officials in China, have been agitating for years for improvmeents. It has been estimated that gunboats of the necessary type for use on the Upper Yangtze would cost approximately $300,000 (gold) each, and five at least would be necessary to properly constitute a mobile force in time of trouble. This at first appears to be a considerable sum of money, and country Congressmen are likely to say that this outlay would conflict with their pleas (usually demagogical, for they do not hesitate to vote for large appropriations of the 'pork-barrel' character for internal waterways in their home districts) for economy. But when the problem is considered from the standpoint of actual saving for the American people, the governmental outlay is found to be infinitesimal. Take one product alone which America obtains from Central and Western China—wood oil—which is used in the United States as a basis for the manufacture of paint. If trade in this one article is stopped (as is quite probable) and American manufacturers cannot obtain this product from China, the price of paint in the United States would imme-

diately go to a point that would cost the American people far more than the outlay for a dozen boats necessary for the protection of all American commerce on the continent of Asia."—*The Literary Digest*, 15 September, 1923.

SALE OF BATTLESHIPS AND BATTLE CRUISERS.—The Navy Department announced today that twenty-one battleships and battle cruisers to be eliminated from the United States Navy, in accordance with the terms of the Treaty for the Limitation of Armament, will be sold for salvage, under sealed proposals, each ship to be sold as a whole and to be scrapped by the purchaser within eighteen months from the date of ratification of the treaty, which became effective August 17, 1923.

The vessels are to be sold in four lots, the sales to be held and bids opened on October 25, November 1, November 8, and November 30.

The first sale, on October 25, will be of battleships and battle cruisers under construction, on the ways at Navy Yards. These are in various states of construction, their designed dimensions being as follows:

Battleships

South Dakota—Length, 684 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons. At Navy Yard, New York.

Indiana—Length, 685 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons. At Navy Yard, New York.

Montana—Length, 684 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons. At Navy Yard, Mare Island, Cal.

North Carolina—Length, 684 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons. At Navy Yard, Norfolk.

Battle Cruisers

Constitution—Length, 874 feet; breadth, 101 feet, 8¼ inches; draft, 31 feet; displacement, 43,500 tons. At Navy Yard, Philadelphia.

United States—Length, 874 feet; breadth, 101 feet, 8¼ inches; draft, 31 feet; displacement, 43,500 tons. At Navy Yard, Philadelphia.

These vessels will be sold in their present state of completion.

The second sale, November 1, will include the following vessels afloat, battleships of older type now out of commission:

At Navy Yard, Philadelphia, Pa.

New Hampshire—Launched in 1906; length, 456 feet 4 inches; breadth, 76 feet 10 inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,558 tons. Built by New York Shipbuilding Company.

Louisiana—Launched in 1904; length, 456 feet 4 inches; breadth, 76 feet 10 inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines and 12 B. and W. boilers; total weight of machinery, 1,596 tons. Built by Newport News Shipbuilding Company.

At Mare Island Navy Yard, California

Georgia—Launched in 1904; length, 441 feet 3 inches; breadth, 76 feet 2½ inches; draft, 23 feet 9 inches; displacement (normal), 14,948 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,769 tons. Built by Bath Iron Works, Bath, Me.

Rhode Island—Launched in 1904; length, 441 feet 3 inches; breadth, 76 feet 2½ inches; draft, 23 feet 9 inches; displacement (normal), 14,948

tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,734 tons. Built by Fore River Ship and Engine Company, Quincy, Mass.

At Navy Yard, Puget Sound, Wash.

Connecticut—Launched in 1904; length, 456 feet 4 inches; breadth, 76 feet 2½ inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,648 tons. Built by Navy Yard, New York.

The vessels to be included in the third sale, November 8, are the following battleships and battle cruisers under construction, on the ways in private shipyards. These are in various states of completion, their designed dimensions being as follows:

Battleships

Iowa—Length, 684 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons, At Newport News Shipbuilding and Drydock Company, Newport News, Va.

Massachusetts—Length, 684 feet; breadth, 105 feet; draft, 33 feet; displacement (normal), 43,200 tons. At Bethlehem Shipbuilding Corporation's plant, Fore River, Mass.

Battle Cruisers

Constellation—Length, 874 feet; breadth, 101 feet, 8¼ inches; draft, 31 feet; displacement, 43,500 tons. At Newport News Shipbuilding and Drydock Company, Newport News, Va.

Ranger—Length, 874 feet; breadth, 101 feet 8¼ inches; draft, 31 feet; displacement, 43,500 tons. At Newport News Shipbuilding and Drydock Company, Newport News, Va.

The following vessels afloat, older type battleships now out of commission, will be offered in the fourth sale, on November 30, 1923:

At the Navy Yard, Philadelphia, Pa.

Michigan—Launched in 1908; length, 452 feet 9 inches; breadth, 80 feet 2½ inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,555 tons. Built by New York Shipbuilding Company.

Minnesota—Launched in 1905; length, 456 feet 4 inches; breadth, 76 feet 10 inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,599 tons. Built by Newport News Shipbuilding Company.

Kansas—Launched in 1905; length, 456 feet 4 inches; breadth, 76 feet 10 inches; draft, 24 feet 6 inches; displacement (normal), 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,562 tons. Built by New York Shipbuilding Company.

At the Navy Yard, Mare Island, California

Vermont—Launched in 1905; length, 455 feet 10 inches; breadth, 76 feet 10 inches; draft, 24 feet 6 inches; displacement, 16,000 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,559 tons. Built by Fore River Ship and Engine Company.

Nebraska—Launched in 1904; length, 441 feet 3 inches; breadth, 76 feet 2¼ inches; draft, 23 feet 9 inches; displacement (normal), 14,948 tons. Equipped with two vertical triple-expansion engines, and 12 B. and W. boilers; total weight of machinery, 1,689 tons. Built by Moran Brothers, Seattle, Wash.

AT THE NAVY YARD, BOSTON, MASS.

Delaware—Launched in 1909; length, 518 feet, 9 inches; breadth, 85 feet 2½ inches; draft, 26 feet 11 inches; displacement (normal), 20,000 tons. Equipped with two vertical triple-expansion engines, and 14 B. and W. boilers; total weight of machinery, 2,036 tons. Built by Newport News Shipbuilding Company. (It may be possible that the work of dismantling the *Delaware* will not be completed in time to include this vessel in the sale of November 30. In that case, the *Delaware* will be sold at a later date).—*Navy Department Press Memorandum*, 9 September, 1923.

ANOTHER RADIO-CONTROLLED TARGET-SHIP—Under the terms of the naval treaty, the *Delaware* and *North Dakota* are to be withdrawn from service as warships with the commissioning of the *Colorado* and *West Virginia*. The *Delaware* will be dismantled and sold. The *North Dakota* will be converted into a radio-controlled target-ship, as the treaty permits one such ship to be retained indefinitely. Extensive gunnery and other experiments will be conducted against the *North Dakota*, and they will be carried on in such manner and with special ammunition with a view of having her remain afloat as long as practicable. Much valuable information was obtained with the radio-controlled ex-*Iowa*, which finally was sunk during the naval exercises off Panama last winter. Much more remains to be developed in connection with gunnery, etc., and it is for this reason that it is considered of prime importance to provide another such ship. Accordingly, it has been decided to fit up the *North Dakota*, which, although not representing a late type of warship design, is far in advance of the ex-*Iowa*.—*Army and Navy Register*, 4 September, 1923.

PLANES FOR SUBS.—Planes are the submarine's deadly enemy. Now the submarine is to be provided with a periscope several thousand feet high, flying ninety miles an hour. Tests are being carried out by the Navy at Anacostia, D. C., on a tiny machine, the *XS-1*, equipped with a 60 horsepower air-cooled engine, weighing but 1,000 pounds, so small that it can be placed in an ordinary living-room. Ingenious construction enables the plane to be knocked down rapidly and stowed away in the few cubic feet of space available in the restricted interior of a submarine.—*Time*, 27 August, 1923.

MERCHANT MARINE

FRESH WATER REQUIREMENTS OF GREAT MODERN LINERS.—It is a common belief that, apart from drinking water, ships can have their supplies taken from the sea; that modern condensing machinery makes it unnecessary to take large quantities. This is not so. Indeed, the quantity of sea water nowadays condensed is very small. Practically all the water used in the internal working of a modern liner, apart from the sanitary service, is fresh, and the quantity, of course, varies with the size of the vessel, points out the *Cunard Magazine*. On a recent trip to New York the *Berengaria* left Southampton with 540 tons of water for drinking and domestic purposes. By the time she arrived at New York, 191 tons had been consumed, at a daily rate of 30.6 tons, or five gallons per person. For her boilers she took 4,638 tons, of which 3,086 tons were consumed, at the rate of 493.7 tons per day.

The *Aquitania,* the other day, carried 342 tons of drinking and domestic water, and consumed 141 tons (21.8 tons per day). For boiler purposes she had 3,309 tons, of which 1,971 tons, at a rate of 277.2 tons per day, were consumed.

The *Mauretania* on a recent trip, was supplied with 195 tons for drinking and domestic purposes, and the 115 tons consumed was at the rate of 18.72 tons, or 3.72 gallons per person. Out of the 1,800 tons for boilers, 1,200 tons were used, at a daily consumption rate of 195.3 tons.

These three ships provide an interesting sidelight to the various kinds of boilers that are used. While the twenty-one and twenty-four double-ended Scotch cylindrical boilers of the *Aquitania* and *Mauretania,* respectively, require about seventy tons each to fill up, the forty-six water-tube boilers of the *Berengaria* only require nine tons each.

On account of the demand on steam for cooking purposes and other reasons, each boiler loses an average of ten tons of water per day, so that the vessels have to carry a large quantity of water in excess of the amount actually required.

The water set apart for drinking purposes is always carried in specially prepared tanks, which are cleared out at the end of every voyage, and to futher insure a pure supply it is filtered on board before it is actually at the disposal of the passengers. The boiler or feed water is carried in the double-bottom ballast tanks.

Fom the foregoing statistics it will be noted that a Cunard leviathan liner needs some 5,000 tons of water for immediate use during a single crossing of the Atlantic. But this is not all. In addition to a stand-by supply, in case of contamination, each lifeboat must carry at least a quart of freshwater for each person. In other words, the lifeboats of the *Berengaria,* for instance, of which there are fifty-six, require a total of a thousand gallons, which is changed each trip.—*The Nautical Gazette,* 18 August, 1923.

Twin-Screw Motorship "Crux."—The new twin-screw motorship *Crux,* which has just been completed by Burmeister and Wain, Ltd., at Copenhagen, is 382 feet long, 51 feet 3 inches broad and 34 feet deep from the shelter deck, with a gross tonnage of 3,828 tons. Her holds have a capacity of 403,000 cubic feet of grain or 373,000 cubic feet of bales, and her double bottom is fitted to carry either water ballast or fuel oil.

The propelling machinery consists of two 6-cylinder, four-stroke, single-acting Diesel engines, which are normally rated to develop 2,300 i.h.p. at 145-150 r.p.m., but owing to the low speed of 10¾ knots desired by the owners the engines in this case were reduced to 2,100 i.h.p. at 130 r.p.m. The daily fuel consumption is about 6 to 6½ tons, and the vessel has a cruising radius of 45,000 sea miles.

All the auxiliary machinery in the engine room as well as the deck machinery is electrically driven, the current being supplied by three dynamos, driven respectively by one single cylindered and two twin cylindered auxiliary Diesel engines. The pressure of the supply for power purposes is 220 volts, but for lighting and heating this is transformed down to 110 volts by means of a motor generator. Any one of the dynamos is sufficient to supply the necessary current required for normal working at sea, but two, or even all three, have to be in operation when the vessel is maneuvering in and out of harbor or when loading and discharging cargo. The machinery space is small, the length of the engine room being only 35 feet 5 inches.—*The Nautical Gazette,* 18 August, 1923.

"Drottningholm's" Record Run.—The steamer *Drottningholm,* of the Swedish-American Line, which left New York on August 4, arrived at

Gothenburg, Sweden, last Sunday night after a record trip of eight days sixteen hours and twenty-nine minutes. This is the fastest crossing that was ever made between New York and Gothenburg.—*The Nautical Gazette*, 18 August, 1923.

GERMANY'S NEW VESSEL TONNAGE.—According to an official statement in the House of Commons by Sir P. Lloyd-Greame, president of the Board of Trade, 685 vessels of 742,100 tons gross were completed in Germany in the year 1922 as against 397 vessels of 450,900 tons gross in 1921 and 330 vessels of 327,700 tons gross in 1920.—*The Nautical Gazette*, 18 August, 1923.

PERCENTAGE OF U. S. TRADE CARRIED IN AMERICAN SHIPS.—The following table shows the total imports and exports of the United States by sea for the past ten fiscal years and the percentage thereof carried in American flag vessels:

Fiscal Year	Total Waterborne Commerce	Per Cent in American Vessels
1914	$3,785,468,512	9.7
1915	3,992,625,475	14.3
1916	5,826,041,211	16.3
1917	7,819,495,133	18.6
1918	7,703,700,456	21.9
1919	8,060,098,394	27.8
1920	11,874,997,809	42.7
1921	8,910,434,710	39.8
1922	5,513,409,464	34.6
1923	6,627,411,621	35.2

TONNAGE OF AMERICAN VESSELS IN U. S. FOREIGN TRADE.—In the following table are shown the tonnage of American and alien flag vessels entered and cleared in the foreign trade of the United States during the fiscal years 1914-23:

	——Total Tonnage——		Per Cent	
	American	Foreign	Amer.	F'gn
1914	27,470,703	79,101,283	26	74
1915	26,693,736	66,901,818	29	71
1916	35,829,742	68,143,163	34	66
1917	37,870,464	64,678,782	37	63
1918	38,489,763	52,980,156	42	58
1919	41,020,746	51,855,601	44	56
1920	55,239,879	53,253,160	51	49
1921	67,946,336	70,124,833	49	51
1922	59,756,486	63,159,285	48	52
1923	61,293,398	72,196,133	45	55

—*The Nautical Gazette*, 1 September, 1923.

KEEL LAID FOR LINER OF OCEAN AIR ROUTE.—London, September 13.—The keel has just been laid for the airship destined for use on the New York-Hamburg airship service.

Borner, the famous Dutch aeronautical engineer, is responsible for the design, and it is expected that the vessel will take nearly a year to complete.

She is designed to give a speed of 100 miles an hour, with 300 passengers aboard, and will be the first ship of her kind ever built.

Her hull has been planned so that she will be able to alight and float on water with safety.

At the outset it is intended to make two trips a week between New York and Hamburg with her, as, allowing for adverse winds, the journey is only estimated to take forty-five hours.

To Compete With Ocean Liners

The syndicate that is building the craft intends to compete, so far as is possible, with the Atlantic shipping lines, and all the accustomed luxuries of the trans-Atlantic liner will be embodied in her design.

She is to be 915 feet long, 165 feet wide at her broadest point, and 140 feet high.

There will be ample space for staterooms, while all food served on board will be cooked by means of electrically heated ovens and an electrically equipped kitchen. Sleeping accommodations will be most luxurious, and there will be neither the noise nor the sudden motion that is familiarly associated with aircraft.

Roof Garden and Smoking Room

A roof garden and a large public dining-room will be provided, and, in addition, for the first time in the history of aircraft travel, the provision of smoking rooms will be possible, owing to the elimination of the fire and explosion danger.

This will be made possible by the use of what is known as the "three-chamber system," which, although it involves additional cost in construction, shows a great saving in regassing.

Completely inclosing the hydrogen envelope will be another envelope filled with nitrogen, the argument being that if the hydrogen should catch fire the flames would be extinguished by the nitrogen, in which most substances cannot burn.

Power will be provided by twelve motors, each developing 268 horsepower. Each engine will drive a separate propeller, but the Borner system makes it possible for the air screws to be adjusted together or in groups.

Mooring masts or hangars will be unnecessary owing to the ship's ability to float, and it is intended to construct an immense airship harbor at Hamburg, with a dome built in a single span, over the water to house the airships when in port.—Baltimore *Sun*, 13 September, 1923.

Sale of Shipping Board Ships.—Chairman Edward P. Farley, of the United States Shipping Board, announced today the sale of seven combination freight-and-passenger ships, known as the 502 type, to the Dollar Line, whose home office is the Dollar Building, San Francisco. These vessels will be operated in an around-the-world service, starting at San Francisco and touching Japan, China, Philippines, Java, Straits Settlements, Singapore, India, through the Suez, Egypt, Mediterranean ports to New York, thence through the Panama Canal to home. By arrangement with the Board, this service is guaranteed for five years. This will be the first round-the-world service of this kind that has been inaugurated, for while the Dollar Company is maintaining freight boats on this service today, there are no other ships now in a continuous service around the world under any flag.

The Shipping Board is of the belief that this service will be of great value to American travelers and merchants, and it will have the full support of the Board in its effort to build up an American merchant marine.

These ships were built by the New York Shipbuilding Company and are of 10,533 gross tons register and 6,195 tons net, five of them being

now operated from New York to London. These will be supplanted by other fast freight ships. The passenger accommodations to London will of course be greatly augmented next year by the capacity of the new *Republic*, ex-*President Grant*, now being reconditioned at Newport News. The other two ships of the seven sold are being operated from the west coast of the United States to the east coast of South America. These also will be supplanted by other vessels.

The first line to be sold by the Shipping Board as a result of their advertisement of April 28, 1923, and for which negotiations have been in progress, were two ships to the Grace line, which will be supplemented by their own vessels and operated from the west coast of North America to the west coast of South America. This service is guaranteed for five years. These vessels were the *Rotarian* and the *Orcus*, both cargo vessels of about 7,500 tons each. They were built by the Todd Drydock and Shipbuilding Company of Tacoma, and completed in 1920.—*United States Shipping Board*, 12 September, 1923.

ENGINEERING

THE LARGEST FLOATING CRANE.—The American battleship *Kearsarge* has been converted into a sea-going crane-ship capable of loading and transporting 250-ton loads. She can deal with two modern three-gun turrets completely with guns. It is officially known as U. S. Navy *Crane-ship No. 1*; and is the only large sea-going crane ever installed, and the largest floating crane in existence.

The crane proper is a revolving one of the luffing-jib type, so designed that the jib may be lowered into a cradle, and there securely maintained for sea service. Though designed to handle loads of 250 tons under normal conditions, she has actually lifted 312 tons. The builders are the Wellman-Seaver Morgan Manufacturing Co., of Cleveland, Ohio, and Kingsway House, Kingsway, London, W.C.2.

The following general data are given in the monthly journal of the American Society of Mechanical Engineers:

	Battleship	Crane-ship
Length	386 ft.	368 ft.
Beam	72 ft. 2½ ins.	92 ft.
Draft	23 ft. 6 ins.	19 ft. 7 ins.
Displacement (tons)	11,520	10,350
Speed (knots)	16	11
Number of vertical triple expansion engines	2	1

SPEEDS OF HOISTS

Main hoist, loaded	6 ft. per minute
Main hoist, empty	16 ft. per minute
Auxiliary hoist, loaded	15 ft. per minute
Auxiliary hoist, empty	30 ft. per minute
Auxiliary trolley	50 ft. per minute
Luffing from high to low position	25 minutes
Rotating completely	9 minutes

RANGES OF OPERATION

Main Hoist.

Radius: Between 72 ft and 101 ft. from center of rotation.

Vertical Range: From 13 ft. above to 40 ft. below rails on which crane revolves.

Auxiliary Hoist.

At 114 ft. radius the auxiliary hook has a vertical range of from 135 ft. above the rails to 40 ft. below. With the jib in its highest position the upper vertical range of the auxiliary hoist is increased to 147 ft. at 91 ft. radius, and the maximum reach with the jib in a horizontal position, is approximately 173 ft. from the center of rotation. The maximum range of the auxiliary hoist is 175 ft.—*Industrial Management,* 9 August, 1923.

New Patent Propeller Device.—A Delft engineering firm has applied for a patent on an invention which may revolutionize present methods of ship propulsion. The ordinary screw propeller is done away with, and in its place a high-speed rotor with two impeller blades is fitted in a diverging channel in the bottom of the ship. The rudder is fitted within this channel, which need be only from ten to twelve feet in length, and by porting or starboarding the helm either side of the channel is closed, so that the ship can turn a complete circle within her own length.

Any type of prime mover can be used and the inventors claim that the efficiency of their device is much greater than that of any other similar contrivance. Tests have been carried out with a small ship model seven feet four inches in length, weighing sixty-six pounds, to which the device has been fitted, the diameter of the impeller being one and eight tenths inches, and driving power being supplied by an electric motor of one-tenth horsepower. The speed reached by this model was about 100 feet per minute.—*The Nautical Gazette,* 8 September, 1923.

Conversion of Steamers to Diesel Drive.—The practically exclusive source of supply for ships for conversion to Diesel drive at the present time is the large idle fleet of the Shipping Board and the operator seeking a vessel suitable for his needs, naturally turns to this source, writes Louis R. Ford in the current issue of the *Morse Dry Dock Dial.* Supposing that one of the 8,800 ton, three island type of general cargo vessel equipped with reduction gear turbine driving a single screw, and three boilers of either the Scotch or water tube type to have been selected as the most desirable unit, the next step is the selection of size and make of main engine. The factors influencing engine size are: speed desired, space available, propeller speed desired, and type of drive preferred. The vessels of this type are at present powered to give about all the speed that is economically possible with their hull lines; about 10½ knots with 2,500 shaft horsepower. If other considerations could be eliminated the logical procedure would be to install 2,500 Diesel horsepower. Here the space factor must be considered. The length of the machinery space in these vessels, including engine room and fire-room is about forty-nine feet, with a ten-foot recess in the aft bulkhead for the thrust bearing. For engines of equal power there is not a great deal of variation in the over-all length of the various makes of the four-cycle type. The shortest available American built engine of 2,500 b.h.p. measures sixty feet seven inches over-all. Less length for equal power is offered by the two-cycle type, but unfortunately the two-cycle builders have not made the two-cycle marine engine of large power readily available commercially. Since a sixty-foot engine would entail a costly sacrifice of cargo space we must consider the next standard size, 2,000 b.h.p. In this size the shortest available engine is fifty feet nine inches. By a suitable arrangement of flywheel and thrust bearing, this size can be made to fit into the present machinery space by utilizing the thrust recess, but its use means a reduction in speed. This sacrifice in speed is, however, more apparent than real, by reason of the fact that the horsepower rating of the Diesel engine represents power that is continuously available day after day whereas the steam horsepower

is subject to wide variations and is seldom maintained at the rated maximum over an extended period.—*The Nautical Gazette*, 8 September, 1923.

COMPRESSORLESS DIESEL ENGINE.—The new Deutz Diesel compressorless engine is said to have achieved some remarkable results. A 120-brake small motor tug owned by the Royal Netherland Petroleum Company of Rotterdam had a compression pressure of only 325 pounds per square inch and a fuel consumption well under 0.4 pounds per brake-horsepower.

Great flexibility is claimed and it is asserted that the engine will run satisfactorily at any speed between forty and 250 revolutions per minute. Engines with an output of more than 200 h.p. will be made directly reversible, but below this power a reversing gear is fitted.—*The Nautical Gazette*, 8 September, 1923.

ENGINEERING MATERIALS.—Corrosion of Condenser Tubes—Flow of Water and Air-Bubble Action.—The Rapid Corrosion of Condenser Tubes, Guy D. Bengough and R. May. A brief summary of conclusions as to the cause of the rapid corrosion of condenser tubes which have been arrived at in the course of an investigation carried out during the last few years under the direction of the Corrosion Research Committee of the Institute of Metals. The full evidence has not yet been published.

The present article deals only with corrosion caused by the presence of entangled air in the circulating water in estuarine and marine conditions. The attack is especially serious, because it can cause tube failure in a few weeks or even days.

This cause is largely independent of the chemical composition of the tube: i.e., any ordinary tubes of commerce of 70:30 brass. Admiralty alloy, lead brass, or arsenical copper will show the action when exposed to suitable conditions. In fact, any selected area of any ordinary tube is liable, and can be made, to show the action. Certain alloys very high in nickel: e.g., containing up to twenty per cent nickel, fail as badly as brasses.

The action which produces the rapid failure has certain characteristics, of which the following is a list:

1. It usually occurs near the water inlet of the tubes in the first pass, and less frequently near the water outlet of long tubes.

2. It occurs indifferently anywhere round the circumference of the tube, and frequently all round it. A considerable area of tube is attacked: i.e., the action is not concentrated at sharply defined isolated pits.

3. A longitudinal section of a tube corroded by this action when rubbed down on an oil stone shows a characteristic "water worn" appearance, from which the direction of the flow of the water can be readily determined.

4. The tubes showing the action are often found to be spaced over a comparatively small area of the tube plate. If a corroded tube be replaced by a new tube, the latter will often again fail rapidly, and the process may be repeated several times.

5. The action is seldom shown by tubes that have been a long time in the condenser: i.e., tubes either show it in their early life or not at all.

6. Ordinary methods of electrolytic protection fail to prevent the action.

7. Metallic copper is seldom found as a corrosion product at the corroded areas; these often seem remarkably free from corrosion products.

8. Ferrules occasionally show the action. These are frequently made of 60:40 alloy, but even in such cases it often happens that no metallic copper is visible at the corroded surface.

As regards the cause of corrosion, evidence seems to indicate that the main cause of the action must be in the conditions to which the tubes are subjected. Furthermore, it has been found that not all the tubes in a single pass are always in similar conditions and behave similarly if of uniform quality. This is due to the fact that the speed at the tube wall may vary in different tubes, as has been found by the use of glass tubes.

The phenomena of flow observed in the tubes varied considerably with the type of water used in the experiments. The behavior of sea water only will be discussed in the present article. The first point of importance to be noted is that smooth flow, such as is usually assumed to take place through all condenser tubes, did not take place through many of the tubes. In certain tubes the water stream formed vortices or more or less flat or extended spirals, especially for the first 2 ft. or 3 ft. of the tube. See Figs. 3 and 4. Where these spirals impinged on the walls local turbulence was set up as shown in Fig. 4. Some approximate measurements were made—by a photographic method—on the variations of speed that occurred at various parts of the tube. For this purpose the introduction of small solid particles of air bubbles was useful; the behavior of these showed clearly that great variations of speed could take place even in a single tube. Thus at certain parts of a tube through which water was traveling at an average speed of 6 ft. per sec., local retardation near the tube wall might reduce the speed almost to zero, while in the center of the tube the speed might approximate to twice the average speed. Turbulence prevailed in different degrees in many of the tubes for a length of 2 ft. or 3 ft. from the inlet end and then gradually died away. When turbulence prevailed high water speeds might be attained locally near the tube wall. The actual amount of water passing through a given tube was, of course, greatest in the tubes with least turbulence; i.e., with the nearest approach to smooth flow. Probably the highest speeds were developed locally in tubes with the greatest turbulence. The phenomena differed noticeably in tubes in different positions relative to the main water inlet. Some tubes showed scarcely any vortices but local impingement on the tube wall near the inlet end—as shown in Fig. 2.

An increase in the water speed increased the complexity of the phenomena; a decrease to 2 ft. or 3 ft. per sec., caused an approximation to smooth flow to take place throughout the greater part of the tube.

TABLE I CORROSION OF BRASS TUBES (18 W.G.)

(Duration of experiment, 28 days; temperature, 20 deg. cent.; speed of water, 10 ft. per sec.)

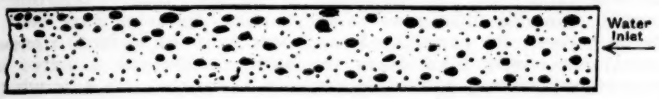
Alloy	Per cent penetration on 1.21 mm. = 18 W.G.	Amount of entangled air in cc. per hr.
70:30	Less than 1	0.7
70:29:1[1]	2.5	0.7
70:30	Less than 1	25
70:30	Less than 1	145
70:30	31	3,000
70:29:1	35	3,000
70:30	83	11,000

[1] Laboratory-cast specimen.

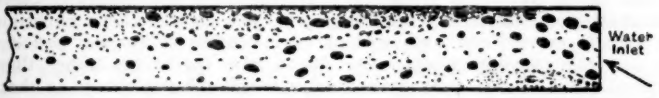
It has previously been found experimentally that an increase in water speed, at least up to about 20 ft. per sec.. increases the rate of corrosion of both copper and brass; consequently, the greatest local corrosion would be expected where the greatest turbulence prevailed: i.e., near the inlet end.

Nevertheless the failure of tubes in practice in a few weeks could not be explained on the basis of high water speed alone. Even with the highest water speed used in the experiments, namely, 25 ft. per sec., a copper tube would have a life of at least six months, at laboratory temperatures.

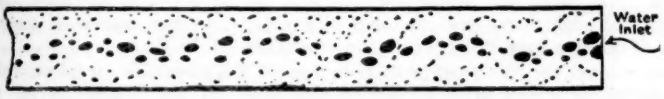
Further tests indicated that entangled air in water is the real cause of rapid corrosion. Sea water was found always to contain a small amount of air in very fine bubbles. These were evidently due to a certain amount of churning in the centrifugal pump which had caused them to pass out of solution. They retain their identity for considerable periods in



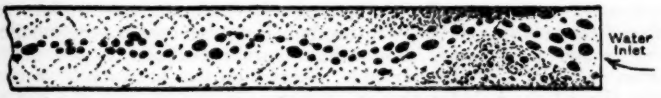
Air bubbles shown black. Nearly smooth flow, characteristic of low water speeds. Large bubbles tend to rise to top of tube. Comparatively harmless form of flow.



Air bubbles shown black. Bombardment of tube wall near end of tube. Produces heavy corrosion on top half of tube, and less corrosion on bottom half owing to the existence of eddies.



Air bubbles shown black. Spiral motion without bombardment of tube wall. Comparatively harmless form of flow.



Air bubbles shown black. Spiral motion and bombardment of tube wall. The worst condition for corrosion. The spirals "flicker" all round the tube and produce corrosion irregularly anywhere or all round the wall.

FIGS. 1 TO 4, BEHAVIOR OF WATER CONTAINING ENTANGLED AIR IN GLASS CONDENSER TUBES

this particular water for the same reasons which cause it to exhibit the familiar property of foaming, which is not possessed by many fresh waters.

Further, some comparative tests were made in which the corrosive effect of sea water containing only dissolved air in normal amounts was compared with that of the same water containing, in addition, mechanically entangled air. The results were very striking, and a few are shown in Table 1. In the case of brass condenser tubes the rate of corrosion is greatly increased when a certain small volume of entangled air is exceeded; thus with three liters of air per hour passing through the tubes their lives would be only about three months. These tests were carried

out by impinging a jet of sea water containing air on to the surface of the tube arranged at right angles to it.

The total volume of air, however, is not the only factor in the case; another important one is its state of subdivision. A given volume of air is more harmful in a fine state of subdivision than when present in large bubbles. A fine foam appears to be the worst possible case. A foam consists of an intimate mixture of air and water, from which the air does not readily separate.

Very small amounts of certain liquids and solids can greatly stabilize foams, that is, prevent the separation of the air: e.g., certain oils and basic salts. Notable differences in the tendency to foam have been encountered between the samples of sea water collected in large stoneware jars and successively filled from the same position on a jetty; such differences may have a noticeable effect on corrosion. As a rough generalization it may be said, however, that the penetration of a tube per month by an air-sea-water jet containing three liters of air per hour in the conditions of Table 1 varies from twenty-six per cent to thirty-three per cent for the ordinary run of 70:30 tubes of commerce. With a highly foaming batch of water higher penetrations are occasionally observed, the highest yet recorded being forty-nine per cent. These experiments were usually carried out with sets of twelve tubes at a time, and it was clear that the varying results were due to the conditions rather than to the tubes, since if one tube gave a high result all the others in that set did so. In all cases the type of corrosion strikingly resembled that which occurs in conditions of ordinary practice.

A small amount of sulphuretted hydrogen in the water, such as is occasionally found in conditions of practice, greatly enhances the rate of attack; thus, with sea water containing 3 cc. of the gas per liter, penetrations of eighty-two per cent and ninety per cent per month of twenty-eight days have been recorded in the conditions of Table 1.

The reason for the peculiar distribution of the corrosion on tubes suffering from the rapid type of action described at the beginning of this article may now be suggested. It will be remembered that the position at which the action is usually worst is the first two or three feet of the tube at the inlet end. It is just at this position that turbulence and impingement of air on the tube wall are worst; here the tube suffers from an intermittent bombardment with air bubbles, as shown diagrammatically in Figs. 2 and 4. Further along the tube the turbulence dies out and corrosion falls off. The remarkable observation has been made, however, that the size of the bubbles gradually decreases, and toward the end of a long tube: i.e., 15 ft., much of the air appears to be distributed as a fine "mist" of air in water: i.e., in just the state in which it is most harmful. So fine is this mist that with an average speed of 7.5 ft. per sec., through the tube no tendency for the bubbles to rise to the top of the tube could be seen. Any roughening of the tube surface by local scale accumulation or otherwise, or any obstruction in the tube will be liable to cause local eddies and local air bombardment, and consequently give a chance for corrosion to start.•

A simple method of reducing the trouble is suggested, namely, to use for replacements Admiralty tubes that have been heated to 40 deg. cent. for a week in sea water, which should be stagnant or only slowly moving. If this cannot be done, then tubes from other parts of the condenser in which failures are known to be few should be used for replacements, and new tubes inserted in the positions thus vacated. This procedure will often require tubes to be moved from the second pass to the first in two-pass condensers, and will be most effective if proper records of failure are kept. (*The Engineer*, vol. 136, no. 3523, July 6, 1923, pp. 7-10, 15 figs., *eA.*)—*Mechanical Engineering*, September, 1923.

ANNEALING.—Quite a number of articles, such as chains and hooks, and high-pressure gas cylinders, are required, both by official regulation and by established practice, to be annealed at more or less frequent intervals. There can be no manner of doubt as to the idea underlying this practice. Put in the most general way, it is simply that soft iron and steel are known to become hardened when overstrained, and, if this overstraining is carried sufficiently far, it is known to exhaust their ductility and to render them brittle. On the other hand, "annealing" is known to soften these metals, and thus, obviously, to undo the harmful embrittling effects of severe overstrain. Hence, the argument runs, since articles which are at times liable to break must on more frequent occasions be seriously overstrained, they are likely to become brittle by use, and can only be kept in a safe condition by frequent annealing. Even more frequently, we meet with the deep-rooted, but really quite unfounded, idea that vibration and fatigue cause iron and steel to become brittle by undergoing "crystallization," and that this defect also can be removed by annealing. The advances of metallurgical knowledge during the past twenty years have thrown entirely new light on these matters, and the time has surely come to look into this question and to decide afresh whether this annealing practice is satisfactory or desirable, and particularly whether official regulations demanding it are right and proper.

The matter raises two distinct, but not entirely independent, questions. First, whether any kind of "annealing" process is either necessary or desirable, and, secondly, if it is, whether the annealing process as ordinarily employed in practice is satisfactory or adequate. In seeking an answer to the first question, we must consider separately the hardening of iron or mild steel by overstrain and the supposed "crystallization" from fatigue or vibration. The first is easily dealt with. Overstrain certainly hardens such materials and tends to render them brittle, but this tendency only becomes serious if the amount of actual plastic deformation becomes relatively large. A wrought iron or mild steel that did not show a twenty per cent elongation on test would hardly be regarded as suitable for use in a chain; yet a chain that exhibited anything like a ten per cent actual elongation of the material, as distinct from mere lengthening of the chain as a whole, owing to the straightening of curved links, would be looked upon with more than suspicion in practice. It may therefore be safely concluded that any *considerable* amount of plastic deformation would not be tolerated in use, and that, therefore, any serious hardening, with its consequent brittleness, is not likely to occur—and cannot occur—without detection by any reasonable system of inspection in ordinary practice. For the purpose of removing hardness and brittleness due to overstrain, therefore, annealing is not required. Turning now to the effects of vibration and fatigue, we find it quite definitely established that in iron and mild steel these actions do not result in any change of the internal crystalline structure—that the old idea of "crystallization" was quite unfounded. On the other hand, alternating stresses of sufficient severity do bring about some internal changes in the metal which, if continued long enough, can lead to fracture. The effect of vibration, as such, may be regarded as nil, unless it brings in its train heavy stresses capable of causing fatigue failure, and in hooks and chains such stresses are out of the question. Even ordinary fatigue effects due to severe alternating stresses can only rarely occur in such articles. Alternate loading—in the full sense of alternate tension and compression—can hardly occur in a chain, a hook, or even a gas cylinder. Hence, working stresses can in practice vary only between zero and a certain maximum value, and unless this maximum value is quite near the breaking stress of the metal, no serious fatigue effects can occur. Even if such stresses did at times arise, it remains to

inquire whether annealing could prevent or undo the damage that might follow, and it may be said at once that such damage could only be arrested, even by the most skilful heat treatment, if it were applied early in the process. Actually, heat treatment not of the wisest kind is likely to do much more harm than good. When, now, we come to consider the actual annealing process as used in practice, we find that as a rule it is exceedingly crude. The article is merely heated to a dull red heat and allowed to cool as slowly as circumstances may permit. What is the effect of such treatment? A severely strain-hardened piece of iron or steel would undoubtedly be softened, but hooks and chains cannot be in that condition unless they have been so abnormally treated as to be fit only for the scrap heap. Slight degrees of overstraining will at times be present, and for these the treatment is liable to be positively injurious, particularly in wrought iron and very soft steel. Such low-temperature annealing is liable to cause, as has been shown by Sauveur, Chappel and others, a rapid growth in the size of the constituent crystalline grains, with serious detriment to the strength of the material. The only really advantageous treatment which could be applied would be a true normalizing," which would involve brief heating above the upper critical range—say, 1,000 deg. Cent. in wrought iron or 900 deg. to 950 deg. Cent. in very mild steel—followed by fairly rapid cooling. Such treatment, if correctly and carefully applied, results in a distinct improvement in the material, but such improvement once accomplished, repetitions of the process can only do harm rather than good.

In the light of these now well-established facts—and they will not be questioned by competent metallurgists—it would seem that the case for continuing the present practice of applying crude and metallurgically incorrect "annealing" to our hooks and chains is so weak as to be substantially non-existent. It may be asked why, if they do not deteriorate in use, hooks and chains do sometimes break after prolonged use. The answer seems to be that such failures are due, in fact, to accidental overloading, which only rarely occurs. Frequently, the fractures have a brittle and highly crystalline appearance, which no doubt gave rise to the old idea of "crystallization." In reality, it is evidence of breakage under a blow or shock—shock fracture exhibits these features in the best and toughest of materials. Annealing, at all events as at present practiced, can only result in a false sense of security where no really increased security exists.—*The Engineer,* 24 August, 1923.

Coming: The Steam Airplane?—The possible use of steam as a motive power in aviation is forecast by the report from Germany of the development there of a steam-driven airplane. A contributor to *The Popular Science Monthly* (New York) says that although this craft is still in the experimental stage, accounts of its performance and the description of its operation have been received by American aviation engineers with tremendous interest. In fact, some profess to see in it the first step in the solution of the problem of furnishing an absolutely dependable motor for the commercial aircraft of the future. We read:

"The steam plane is constructed throughout of duralumin, the extremely light aluminum alloy which has been used successfully in airplane construction in this country. The engine is an adaptation of the Diesel engine, now extensively employed in the United States Navy. It burns a combination of crude oil and other oils, which is broken up under a forced air feed and sprayed against the boiler. Here it ignites, giving terrific heat considering the relatively small quantity of oil consumed in the operation. Ten gallons of oil are said to be sufficient to run the plane's 750-horsepower engine for eight hours. American aviation engineers are

inclined to question this statement, as well as the report that only 1,000 pounds of water are used in a flight of ninety-five hours, although they agree generally that the principles employed in the new plane are sound and are likely to lead to important developments.

"The steam turbine and boiler are said to be considerably lighter than other engines capable of developing equal horsepower. It is claimed also that the new plane will carry much less weight in oil and water than the weight of gasoline carried by an ordinary airplane of the same size, equipped for a flight of equal duration.

"The water used to generate steam in the new plane is carried in the metal wings, in compartments so arranged that the water may be shifted to 'trim ship' if desired. The steam is condensed after exhaust and conveyed back to the wings in the form of water.

"George W. Lewis, executive officer of the National Advisory Committee on Aeronautics, says that the U. S. Government has done considerable experimental work on steam power for airplanes, but has met with only partial success because of the problem of condensing water without the use of heavy equipment. For the heavier-than-air machine he believes steam power does not look encouraging at this time, but ultimately it will be of considerable use in the propelling of rigid dirigibles. Lewis and other aeronautical engineers in the Navy agree that steam is the apex of efficiency, and that its thorough reliability under practically every condition makes it a fertile field for experimentation."

The recent record-breaking long-distance flights of the Army aviators, Lieutenants Oakley G. Kelly and John A. Macready, who flew from coast to coast without stop, indicates, the writer thinks, that while the body of the modern airplane is sound, its heart—the power plant—is weak and constantly giving trouble. He goes on:

"Navy Department statistics show that the Liberty motor must be overhauled after approximately seventy-two hours of flight, at a cost of 300 man-hours—more than $600. The Navy now is concentrating its attention on the improvement of engine-reliability.

"Aeronautical engineers long have recognized that the development of a motor that will combine lightness of weight with high-power efficiency, but that will lack the uneven performance of the present internal combustion engine, probably is the principal problem confronting them in pushing the commercial possibilities of aircraft. Until recently their experiments have supplied no definite hope of finding an effective substitute for the present engine."—*Literary Digest*, 3 September, 1923.

AERONAUTICS

Navy Questions Air Triumph.—The navy is now and will continue for some time to come to be the first line of defense for the United States and the modern warship is not, as some have contended, obsolete. This was the contention of naval officers here today after studies had been made of the sinking of the battleships *New Jersey* and *Virginia* off Cape Hatteras on Wednesday.

While no active naval officer is willing to be quoted on the results of the bombing test because of the desire of both the Army and Navy officials to avoid a controversy, the test demonstrated conclusively, in the opinion of the Navy, that while a single enemy vessel might at any time be easy prey for an attacking airplane fleet, yet an enemy fleet could not be repulsed with aircraft, and there is considerable doubt whether any material damage could be done to individual vessels in fleet formation.

Air service officials, of course, believe the tests were a victory for the air service and they renew their predictions that with the advance of the bombing science they sooner or later will be able to attack successfully any

fleet which might be sent against the shores of the United States. While they asserted the tests were intended only for experimental purposes, to demonstrate the value of high altitude bombing with the new secret photographic bomb dropping device, they contended that the sinking of the *Virginia* in the short time of one-half hour after the first attack is conclusive proof of the effectiveness of the Army air service against hostile ships.

War Conditions Absent

Naval officers have pointed out, and air service officers readily admitted, that the attack was not carried out under war conditions. The visibility was fair; the ships were anchored; the use of anti-aircraft guns was of course avoided; and it was assumed at the start of the attack that the Army air service had fought its battles for conrol of the air from the airships of the enemy fleet and had won.

Under all these circumstances and the fact that the *New Jersey* withstood the high altitude bomb, and finally had to be sunk from a lower altitude, naval officers will not concede that the aircraft showed any superiority whatever over modern naval vessels and especially will this be true with the modern method of protecting the hulls of capital ships with several thin pieces instead of one thick piece of armor.

It was pointed out by the naval officers that a hostile fleet would come protected by planes from its airplane carriers which might for some time so protect the fleet as to force the attacking air force to return to its base for supplies. Not only this, but the new anti-aircraft guns aboard the battleships are declared to be of such efficiency as to force hostile aircraft to maintain an extremely high altitude for safety. The ships have the advantage of moving through the water at comparatively high rate of speed, thus nullifying an advantage which might be gained through the use of perfected range finders and bomb dropping devices on planes.

Naval officers said today that an attacking air force might be a very great handicap to an enemy fleet and that single enemy ships probably would be at the mercy of a hostile fleet. For single ships to attack the shores of the United States it would, however, have to be assumed that the enemy had control of the sea, which it could only get after defeating the United States Navy. In other words, it must be conceded that the Navy is the first line of defense, and this succession will stand until the air service proves it can overcome the advantages which a hostile fleet would have if it had control of the sea.

Fine Spectacle, However

The sinking of the two giant ships was a spectacular affair. The day was clear and bright though the visibility was not extraordinary. First came the scout planes, the little fellows flying at great speed to reconnoiter and report by radio to the great bombing fleet which came on behind. Then came the bombers, eight of them, flying so high they appeared to be mere specks in the sky despite their great size. They came on in formation, having flown 150 miles from Langley Field, though a temporary airdrome had been hastily constructed on the sands of Cape Hatteras for the other ships of the air fleet. Once they approached the *New Jersey*, they fell into single file and circled once over the ship to get their bearings and take their sights. Then they came back, dropping their bombs as they got the range. These bombs, though dropped from a distance nearly two miles in the air, were plainly visible shortly after they left the planes and could be seen until just before they reached their marks. After the first attack Brigadier-General Mitchell, flying a scout plane, flew by the transport *St. Mihiel*, from which the observations of the attack were

made, and pointing downward, indicated that the ship was already sinking. He proved a bad prophet, however, for it was several hours later before the *New Jersey* went down under an attack from a low altitude.

The object of the air service, as Major-General Mason M. Patrick, its head, explained to the newspapermen, was not to make direct hits against the ships but to come as close as possible to them without hitting them. Protective deck armor enables a ship to withstand direct hits at times, whereas bombs dropped close to the ship explode about fifty feet under water, if the fuses are right, thus opening up seams in the vessel's hull and causing her to sink much more quickly than through direct hits, which are of course damaging but do not necessarily disable the ship.

Smoke Screen for "New Jersey"

After the first attack a smoke screen was laid around the *New Jersey*. The airmen laid this screen from tanks carrying a liquid which becomes smoke on being released and exposed to the air. It was explained by observers that this smoke might just as well have been one of poison gas which would have completely circled the ship and, although possibly causing no damage by reason of the availability of gas masks on the ship, might seriously have impeded the work of the gunners and the navigators, provided it had been an enemy ship.

The *New Jersey* was, after the first attack, listing about five degrees and as the *St. Mihiel* circled her at close range, it was evident that the attack had caused great damage. Some of the air officers insisted the *New Jersey* would have sunk without a final attack later in the afternoon, but this was disputed by naval officers, who pointed out that even with many of her water-tight compartments removed, she still would have remained afloat and probably could have reached port if she had been an enemy ship. However, it will never be known whether she would have gone down as no one boarded the ship after the attack and the only inspection of the *New Jersey* was from a distance.

It did not take long to sink the *Virginia* with one attack of seven airplanes from an altitude of 3,000 feet from which eleven 1,100 pound bombs were used. Ten of these bombs came close to the *Virginia* and the other was a direct hit on the decks of the ship, carrying away her forward fighting mast and doing great damage. Army officers said, however, that the bombs which caused the sinking probably were those which dropped clear to the side of the ship.

Great spurts of water, mixed with the black gas from the bombs themselves spurted over the sides of the ship at each explosion. The *St. Mihiel*, two miles away, distinctly felt the shock of the explosions, and it was evident that from a 3,000 feet altitude any warship would be in great danger if attacked by enemy airplanes.

When the *Virginia* finally turned on her side and went down, stern first, her bow went high in the air and spectators took off their hats and officers stood at attention as she took her final plunge. One naval officer had been on the trial trip of the *Virginia* and remembered when she was the pride of the United States Navy.

Fourth Attack Necessary

Later the third attack was made on the *New Jersey* which failed to sink her and it became necessary for a fourth attack to be made, which was done by three airplanes carrying 2,000 pound bombs and flying at an altitude of 3,000 feet. One plane deliberately circled the ship three times before he finally released his bomb and was rewarded for his care by seeing the ship topple over and sink. The name of the air service officer flying this ship was not made public.

Just prior to this time it was thought another day might have to be taken to get the *New Jersey* out of the way as she was a menace to navigation where she stood. Both ships were sunk in about fifty fathoms of water.

It was understood that the Army air service was well pleased with at least two mechanical features of the experiment. One was the new fuses, which seemed to work with precision, and the other was the new bomb dropping and range finding device. Only one bomb exploded at any great distance from either ship and this came so close to a mine planter that fears were expressed for her safety. It was explained that this bomb probably became fouled in the dropping device and failed to release when the bomber expected.

Also the Army air service was well pleased with the new smoke screen device which was invented by Dr. T. B. Hine, a chemist who was an interested spectator of the effect of his invention.—New York *Sun* and *Globe*, 7 September, 1923.

Airships a Necessity for the United States.—In the Baltimore *Sun* of April 13, 1923, there appeared an article by Hector C. Bywater which stated that airships were of limited use in time of war. Mr. Bywater attempted to show in his article that the United States Navy, which is developing rigid airships for this country, is engaged in an expenditure of public funds on an expensive and utterly useless plan, and, further, that airships are likely to prove absolute death traps for those who are foolhardy enough to go cruising in them during a war.

Mr. Bywater seemingly has based his knowledge of the airship situation on the fact that he has seen rigid airships in flight in Germany, has seen them in action when they were dropping bombs over London, and also states that he has read the official German reports of their Zeppelin fleet and its achievements. I submit that this is hardly sufficient to establish qualifications as an airship expert.

As a matter of fact, Mr. Bywater is not an airship expert, but is an expert on naval affairs as they enter into the political and economic welfare of the British Empire. He is one of the most brilliant naval writers of the day. He is also one of the most trusted individuals in Great Britain as far as the British Admiralty is concerned.

There is a controversy in Great Britain between the British Admiralty and the Royal Air Force, a controversy which has laid bare certain facts—which facts are as follows:

When the Royal Air Force was created as a war measure the Admiralty turned over the Royal Naval Air Force to those in control of the Royal Air Force, and naval aviation then became a part of a separate service and passed from the control of the Admiralty. Along with the Royal Naval Air Force went the airship section thereof, which immediately became a part of the Royal Air Force.

Not long after the establishment of the Royal Air Force the British Admiralty discovered that it had made a serious mistake; that the control of aviation by the Royal Air Force, insofar as it applied to the exigencies of the naval service, did not make for economy, and utterly failed to take into consideration the naval needs of the hour. There has been a constant effort on the part of the Admiralty to take back that part of the Royal Naval Air Force represented by the airship section. Such a move is looked upon by the Royal Air Service as an entering wedge for loss of control and the return to the Admiralty of naval aviation.

To combat this the Royal Air Force, under the guise of a measure of economy, has frowned upon the development and manufacture of rigid airships. At the same time there has been unanimity between the Ad-

miralty and the Royal Air Force in discouraging any other nation entering the field until Great Britain can supply herself with a large fleet of such ships and obtain the ascendancy over all other powers.

Through the control exercised by the Allied Council of Ambassadors, Germany has been unable to build rigid airships; consequently that nation is out of the race altogether. France, intent upon dominating the air in Europe, has concentrated on airplanes and seaplanes, and, with her restricted areas, has not found it necessary to develop rigid airships. Italy is building only semi-rigid airships of sufficient capacity to negotiate the Mediterranean.

No other European nation has the funds and the technical staff to produce such craft; consequently the United States alone appears to be a competitor with England. Propaganda has been emanating from British sources ever since the sale of the *ZR-2* to the United States, discouraging any further attempt on the part of this country to extend its air force by the addition of rigid airships of large size.

The answer to the question "Are airships of limited use in time of war?" There is but one answer; they are limited. So is every other type of craft that roams the seas, on the surface or beneath; but all types of naval craft combined, including air, surface and underwater, make a complete whole, which, properly maneuvered, from the strategical and tactical standpoint, make up the backbone of sea power, and, in our case, forms our first line of defense.

Howbeit, because destroyers are limited in their scope of action we do not scrap destroyers; because supply ships are limited in their scope and are extremely vulnerable we do not scrap supply ships, and, by the same token, because airships are vulnerable to a certain degree we should not neglect to develop that highly important arm of our naval service.

Of course, airships are vulnerable. Mr. Bywater, however, points out that the Germans lost fifty-two airships, therefore airships are not only useless but absolute death traps. As a matter of fact, the following is a summarization of airship operation by the Germans during the war, or, more properly, the summarization of the German rigid airship program until the *Bodensee* and the *Nordstern* were taken over by the Allies in 1919.

Germany built altogether from 1900-19, 143 rigid airships. Of these sixteen were dismantled as obsolete, thirteen were dismantled and taken out of service because of lack of facilities for overhaul and replacement; sixteen were shot down in action; seventeen were wrecked as a result of action; fifteen were wrecked during forced landings in storms, the landings being under war conditions and very hazardous; sixteen were wrecked in bad landings by green crews; seventeen were destroyed in sheds by fire; four were destroyed while being handled on the ground by inexperienced crews at night; six were destroyed by fire in flight; seven were turned over to the Allies—two to Great Britain, two to France, two to Italy and one to Japan; seven were deliberately destroyed by their crews to keep them from falling into the hands of the Allies, wrecked in just the same way that the German fleet was scuttled at Scapa Flow; seven were partly built and work discontinued at the time of the Armistice; two were built subsequent to the signing of the Armistice and were put into commission and used as passenger ships until taken over by the Allies. Of these 143 ships, thirteen were commercial and carried thousands of passengers without the loss of a single life.

To further summarize, during the fifty-two months of the hardest-fought war of all time, Germany lost eighty-three rigid airships employed in actual wartime use. But how about the vulnerability of surface craft in wartime? During the same fifty-two months more than 13,000,000 tons

of merchant surface vessels, representing $8,000,000,000, were sent to the bottom by enemy action. More than 1,200,000 tons of surface warships went down in action, while, during the same period, 2,000,000 tons of shipping was lost by the ordinary hazards of the sea, wrecked in storms and by bad navigation, just the same as the Zeppelins were wrecked in storms and by bad landings.

As a matter of fact, in the battle of Jutland, three enormous battle cruisers disappeared in a flash from the surface of the water with a loss of practically their entire crews; 3,500 men blown into eternity in an instant. As a matter of fact, in this battle the British lost fourteen warships, six of which were first line; the Germans lost eleven ships with a tonnage of 60,720 gross tons; and the officers and men killed and drowned were 6,447 for the British and 2,586 for the Germans, the high proportion of British dead being due to the six large ships that were sunk. It appears to the reasonable person that the case of vulnerability between airships and surface craft is six of one and half a dozen of the other.

Mr. Bywater states that German rigid airships had virtually no influence on war operations by land and sea. This does not agree with the facts. I have been told personally by an officer of the Imperial German Staff and on the Imperial German Council during the war that German Zeppelin attacks were made on England for two specific purposes: first, to damage British morale to such an extent that large forces of troops would have to be held on British soil as a safeguard against riots, strikes and political disturbances—and it is well known that upward of a quarter of a million troops were kept in England at a time when their presence on the western front would have been a critical matter to the German forces; secondly, anti-aircraft equipment, small dirigible blimps and a large number of aircraft squadrons were held in Great Britain to cope with the Zeppelin situation. Had all of that force been on the western front during the period of Zeppelin activity, the preponderance of air power along the Flanders sector of the western front would have passed out of German hands.

It is another well-known truth that on those occasions when the German fleet put to sea accompanied by Zeppelins the British sea forces were never able to make contact with them. It was this distressing state of affairs that caused the British to turn to the construction of British airships of the *ZR-2* or *R-38* type.

In desperation the British took enormous risks. They designed types of airships which neglected many essentials, including the factors of safety always present in German rigids. The result is well-known: forty-four of the most skilful airship officers and men, some British, some American, were killed by the mechanical failure and the destruction in the air of the *ZR-2*—a British ship; British built, and British handled.

The loss of the *ZR-2* furnished the Air Ministry with a decidedly acceptable excuse for stating that airships were no good and to offer to turn over free those airships which were left in Great Britain to any commercial company that would take them and operate them. Certain restriction, however, made it impossible for anyone to accept such an offer. Then the British tried to sell some of their airships to the United States in part settlement of our claim against Great Britain for the loss of the *ZR-2*, all of which made excellent camouflage for public consumption, but covered up the deliberations of the Imperial Council held in London in August, 1921, and the desperate attempts of the British at the Council of Ambassadors in Paris to keep the United States from obtaining a rigid airship in Germany.

It was only by confronting the British officials at the Paris Council with the figures evolved at the Imperial Council in London that our Navy was finally allowed a rigid airship, German built, of sufficient capacity to

warrant an attempt to bring it across the Atlantic. In other words, at the conference in Paris, Great Britain maintained that any airship larger than 27,500 cubic meters gas capacity was a war airship and could not be built under the Versailles treaty stipulation in Germany; while, at the same time, the Imperial Council in London declared that rigid airships of less than 100,000 cubic meters gas capacity were useless, even as commercial ships—one standard for themselves and another for the United States. This is the subject matter of Mr. Bywater's thesis.

Admiral Moffett, in a series of articles in *The Sun*, printed April 16 and 17, has covered the sensible use of airships adequately; therefore, it is not necessary for me to continue this discussion further, except to say that rigid airships have an exceedingly important function in the military and naval establishments, while in the case of commercial aviation they are in a class by themselves as carriers of large cargoes and large passenger lists over long distances and at high speed.

With the proper attention paid to design and construction, with the substitution of helium for hydrogen as a buoyancy medium, and with the development of oil-burning engines, they furnish one of the safest vehicles known to transportation. For the United States, with its enormous expanse of territory and the great distances between its continental limits and its Far Eastern insular possessions, such ships are a necessity.—Clifford A. Tinker in Baltimore *Sun*, 19 May, 1923.

Two Giant Airships to Fly U. S. Colors.—Washington, August 27.—Two of the world's largest airships will be added to Uncle Sam's air force this fall. About September 1 the *ZR-1*, gigantic all-American-built ship now being inflated with helium gas in its hangar at Lakehurst, N. J., will be launched, the Bureau of Aeronautics of the United States Navy Department has just announced. Some time in November the still larger *ZR-3*, now nearing completion in Germany, will probably be flown to this country for delivery to our Government. Both ships are to have their home in the huge hangar at Lakehurst.

Hydrogen gas will be used by the German builders of the *ZR-3* in the trans-Atlantic flight to deliver the big ship. When turned over to the United States, it will be refilled with the non-explosive helium gas for actual service under the American flag.

The *ZR-3* will be slightly larger and somewhat heavier in appearance than the *ZR-1* built in this country. It will be 660 feet long, while the *ZR-1* is 680 feet in length. But although twenty feet shorter it will have a diameter of ninety-two feet, as compared to seventy-nine feet, the diameter of the *ZR-1*. It will have a total gas capacity of 2,400,000 cubic feet, as against 2,100,000 cubic feet gas capacity of the American-built ship. The German-built craft will be driven by five Maybach 400-horsepower engines, while the power plant of the *ZR-1* consists of six 200-300 horsepower Packard engines.

These two companion ships are both of the rigid Zeppelin type of airship which consists of a girder framework of duralumin metal, inside which are a series of some twenty gas bags or compartments, the whole being attached to a rigid keel which forms the main corridor of the ship wherein are the quarters for the crew of about thirty men, gasoline tanks and water ballast tanks.—Baltimore *Sun*, 27 August, 1923.

High-compression Engines.—The various devices proposed for insuring engine efficiency at high altitudes are intended to give the practical result of permitting aeroplanes to travel at considerable speeds in the rarefied atmosphere. As speed is a factor in economy it is hoped by this means to insure air transport over long distances at low cost. The first attempt was

made with the turbo-compressor of Professor Rateau, which ensured a definite proposition of air to petrol irrespective of the density of the atmosphere. Still more encouraging results are now being obtained with the use of high-compression engines, whereby alcohol and similar fuels that are not susceptible to self-ignition are employed under normal conditions of atmopheric density, and petrol is used at high altitudes where the quantity of air is reduced to an extent that the petrol fuel works at a normal compression. This necessitates carbureter adjustments to which special attention is now being given by makers of such apparatus. The method of starting on a fuel capable of high compression, and of turning on to petrol at high altitudes, was employed by Sadi Lecointe last week, when he broke the record by attaining a height of 10,800 m.—*The Engineer*, 10 August, 1923.

ORDNANCE

SEA GUNS.—The two new capital ships, *Nelson* and *Rodney*, are to mount nine 16-inch guns, disposed in three turrets. And so the evolution of heavy armament in the British Navy advances by another inch of caliber.

It is true that during the later stages of the war Hadfields built 18-inch naval guns, which weighed 145 tons apiece unmounted, and, I believe, these are still in store, but as they have never had hulls fitted under them they cannot be regarded as filling a definite place in the history of sea armament. Lord Fisher had an unbounded belief in the heaviest possible gun, and these weapons were doubtless the materialization of his ideas. They were originally intended to be carried in the light battle cruisers of the *Glorious* type, but it was decided that the weight was too much to impose upon such high-speed, lightly-built hulls, and the 15-inch pattern was mounted. In principle, of course, Lord Fisher was perfectly right. The heaviest smashing blow is likely to prove the knock-out blow. But in practice the advantage of additional weight of projectile beyond certain limits has to be bought at a sacrifice of other qualities which makes the question of worth while a very debatable one.

The Heaviest Guns

The British Navy has carried guns of bigger caliber than these new weapons during its modern history. The climax of the short, fat, "soda-water bottle" pattern was reached about thirty-five years ago with the advent of the 16.25-inch Mark III. B.L. gun, as mounted in the ill-fated *Victoria*, *Sanspareil*, and *Benbow*. Some particulars of this gun which was so much before its time that the ships mentioned could only carry two apiece, may prove of interest.

It weighed 110.5 tons, unmounted. The length of it, overall, was 43 ft. 10 in. and it was what is technically known as a thirty-caliber gun. The greatest diameter of the chamber was 21.125 in. It was rifled to one complete twist in thirty calibers. The projectile weighed 1,800 lb., and with the comparatively primitive loading gear then in existence it was some business to get off a round. The propellant charge was 960 lb. of slow-burning cordite, and the bursting charge of the common shell 193 lb. The gun had the quite respectable muzzle velocity of 2,087 foot-seconds, but a high trajectory, and it kicked so fiercely owing to unequal absorption of shock that it generally did extensive mischief to its own ship. I have seen its contemporary 13.5, of sixty-seven tons, fired on board the old *Hood*, and more than half the glass in the wardroom skylight regretted the performance. Shooting with uncapped shell, the 16.25-inch gun could perforate 29½ inches of wrought iron, or thirteen inches of Krupp armor, at 3,000 yards.

The Admiralty has not vouchsafed any data regarding the new 16-inch gun. But according to Sir George Thurston, the piece is of forty-five calibers in length, fires a projectile of 2,330 lb. with an H.E. bursting charge of 290 lb. at a muzzle velocity of 2,500 foot-seconds, and a penetrative power equal to 60.4 inches of wrought iron at the muzzle. The muzzle penetration of the old 16.25-inch gun was thirty-eight inches of wrought iron.

The 15-inch gun, which is the biggest yet mounted in complete British capital ships fires a projectile weighing 1,920 lb. with a muzzle velocity of 2,450 foot-seconds, and a penetrative power equal to 54.7 inches of wrought iron at the muzzle. The greater power of the new weapon is therefore evident.

American Weapons

Talk is always well ahead of materialization, or even the possibilities of materialization, in naval armament. The United States Navy has had the 16-inch gun for some years past now, but it is only since this has been increased from forty-five to fifty calibers, for the battle cruisers of the *Lexington* type, that it has proved itself in any way superior to the British 15-inch gun, which has a higher muzzle velocity and therefore greater penetrative power. In 1920 the Secretary of the United States Navy reported that the *Saratoga* and *United States* would mount 18-inch guns. This may have represented intention at the time, but thus far no American ship has been designed to carry anything above the 16-inch pattern.

The chiefly interesting feature in connection with the armament designs of our two new capital ships, and one which will cause much demur in naval gunnery circles, is the adoption of the triple turret. It is doubtless the fact that this step has been forced upon Sir Eustace d'Eyncourt by the restriction of displacement under the Washington Agreement. Gun-mountings are the heaviest features of warship construction, and the problem is accentuated by the fact that the weight has to be carried so high above the center of buoyancy. In foreign navies three and even four-gun-turrets have been in vogue for years past. The two chief objections to them are that they represent the principle of putting too many eggs into one basket, so that if a turret is disabled a ship loses a very serious proportion of her fighting power, and that the wing guns, being mounted so far out of the center radial line, cause the turret to "set" every time they are fired, thus adding to the difficulty of maintaining accuracy of shooting.

Early Turrets

The first attempt at what later developed into the turret idea was in the armament of the *Hercules* launched in 1868. She carried eight 10-inch 18-ton guns, four on either broadside, mounted on what was known as Captain Scott's turntable and racers. She was followed by the *Monarch*, which carried four 25-ton muzzle-loaders in two turrets. Then came a whole series of experimental vessels, including the luckless *Captain*, in which the high and low freeboard schools fought for the mastery of their theories. In the *Inflexible*, launched in 1876, the turrets were placed en echelon. In the earlier Dreadnaughts wing turrets were employed, and it was only by following the American principles of super-posed mountings which in small ships proved a serious menace to stability, that our designers were able to revert to the well-proven plan of center-line armament.

But throughout the long era of turret and barbette experiments I can find no record of any attempts to mount more than two guns in one citadel. The Germans, who, whatever else we may think of them, are entitled to respect for the efficiency of their naval designs, also adhered to the

double turret. As I have said, there can be little doubt that the Director of Naval Construction has been compelled by limitation of displacement to adopt a form of armament disposition which is alien to all our traditions, and which he would have avoided had he been able. Sir George Thurston shows that in a ship of 35,000 tons (the maximum allowed by the Washington Conference) an armament of 15-inch guns would claim 15.1 per cent of her total displacement, whereas a corresponding armament of 16-inch guns would demand 20.3 per cent. Having to reconcile the eternal conditions of compromise with the essential features of war-worthiness, Sir Eustace d'Eyncourt has evidently determined to reduce the number of turrets by one, and to give each of the others an additional gun.

One question which will undoubtedly be asked in naval gunnery circles is as to whether the small margin of combatant superiority of the 16-inch gun over the 15-inch gun is worth this departure from the long-approved principle of our service. But it would be absurd to suppose that this consideration has not been fully weighed by the Department of Naval Construction, and that, on balance, the answer has been found as now expressed in the specifications of the new ships.—Sir Herbert Russell in *The Naval and Military Record,* 15 August, 1923.

200 Hits in Row at 500-Yard Range.—Washington, August 30.—Two hundred consecutive hits on a 16-inch bull's-eye at 500 yards were scored today by Sergeant Edgar J. Doyle, of the Marine Corps, in the annual interstate shooting tournament at Sea Girt, N. J., according to word received here. The score is believed a world record for firing with any rifle, fitted with any sights and at any range.

Each competitor had two sighting shots, after which he continued to fire as long as he hit the bull's-eye.

Sergeant Doyle was declared winner, after all his competitors had dropped out, with an unfinished run of 200 hits.—Baltimore *Sun,* 31 August, 1923.

The Gun Range Controversy.—The *Scientific American* recently published an article by Mr. H. C. Bywater in which the question of British naval gun ranges was discussed at some length, and the conclusion reached that the disparity between the ranging power of the British and American battle fleets was less pronounced than the Washington naval authorities appeared to believe. All data contained in the article were of official origin, either British or American. They showed the American fleet to possess a decided advantage at extreme range, as several ships could use their guns up to the limit of visibility, while on the British side only the *Hood* was capable of doing this. At more moderate ranges, however, the superiority passed to the British fleet. Some account was also given of the technical disadvantages involved in mounting naval guns for firing at high angles, such as a deeper turret, larger gun-ports, etc., and it was remarked that the military advantages to be gained by such increase would probably be inconsiderable. Objection is taken to this article by the *Army and Navy Journal* of New York, which describes it as an attempt to back up British contentions against American interests and cast discredit on America's naval advisers. Mr. Bywater wrote in his article that "no mystery has ever been made about the maximum elevation of British naval guns." This, however, the *Journal* contradicts. Repeated but unsuccessful efforts, it asserts, were made by American authorities to get this essential information accurately from the British Admiralty. "Finally, at a psychological moment which would not do other than influence the the action of our Congress, the exact data were given to our State Department by the British Ambassador." It is unfortunate that this conviction of

British duplicity should be so firmly planted in the minds of certain American naval critics, but so long as it persists every action the British Government takes will be open to misconstruction. We do not know whether our Government ever raised any objection, formal or otherwise, to the proposed increase of American gun elevation, but we hope it did not, for the Americans had a perfect right to take this step if they wished. Our only ground for complaint lay in the Navy Department's circulation of inaccurate information respecting the changes alleged to have been made in the turret mounting of British battleships, and that particular incident was closed months ago.—*The Naval and Military Record,* 8 August, 1923.

MODERNIZING CAPITAL SHIPS.—No money has been voted by Japan specifically for increasing elevation of guns. The sum of 50,000,000 yen (£5,000,000) in round figures has been earmarked for "alterations to capital ships," to be divided between the years 1923-31, the amount to be expended in 1923-24 being 2,259,000 yen. It is understood that the existing capital ships are to be given increased protection against air attack, but the details regarding any further alterations that may be contemplated are not known. It is understood from Press reports that ships are to be taken in hand one at a time and the work is to be completed by 1931.—(First Lord.)—*Army, Navy and Air Force Gazette,* 1 September, 1923.

THE AIR BOMB MENACE TO WARSHIPS.—As was noted in these columns recently, American naval officers are inclined to look with disfavor on bombing trials carried out against obsolete men-of-war by military aviators, because of the hasty and probably unwarranted conclusions which are always drawn on such occasions. The *Ostfriesland,* an ex-German Dreadnaught with underwater protection on the best pre-war principles, was sunk by one or two very large bombs that detonated below water a few feet away from the ship. These missiles were dropped from a very moderate height, and the leak they started must have been pretty severe, though had there been a crew on board to work the highly-efficient pumping system the ship might have remained afloat. When analyzed this *Ostfriesland* experiment is seen to prove nothing beyond the facts that (a) a heavy charge of explosive detonating some little distance away and below the armor belt would inflict damage sufficient to sink a pre-war capital ship if the inrush of water could not be checked in time; and (b) that bombs powerful enough to cause such damage could be carried by aircraft working from a shore base. Both facts, must, however, have been fully appreciated before the experiment.

From the practical point of view more value attached to the trials lately made against H.M.S. *Agamemnon,* for in this case the object was to determine the accuracy of bomb dropping from high altitudes against a moving and maneuvering target ship. The *Ostfriesland* affair resembled those tests to which the artillerists of the last generation were so partial, when eighty and 100-ton guns were fired at targets representing the side of some existing ironclad under conditions diametrically opposed to those of actual warfare. The power of those enormous weapons was never really in dispute. But when it came to trying them out at sea, on a moving platform and against a moving target, it was soon found that the percentage of hits was infinitesimal; yet in spite of this discovery very little was done to improve the sights and other appliances on which their accuracy of fire depended.

Further trials with bombing aircraft are about to be held in the United States, two old battleships having been placed at the disposal of the War Department for this purpose. But this time the attack will be made with a greater regard for realism, and though live bombs are to be used, includ-

ing some of the heaviest caliber, the aeroplanes are to fly at a great height —as much as 20,000 feet at one stage of the practice. Judging from past experience few hits are likely to be scored at this altitude, even though the target is stationary.

But while so much is heard about the admittedly destructive effect of bombs which fall in the right place, little is published about the development of anti-aircraft material. It seems to be widely assumed that no progress has been made in this direction since the war. But, in fact, there has been steady improvement both in anti-aircraft artillery and its ranging and fire control devices. There are now in existence guns which surpass in all respects the best high-angle pieces employed during the war, capable of being served with far greater precision, and using projectiles of greater destructive power. French ordnance experts are known to have devoted the closest attention to this subject, but in view of the strict reticence observed it is not possible to verify the truly astonishing results which are unofficially reported to have been achieved with the latest seventy-five and 100-mm. A.A. pieces. That this very important branch of military science has not been neglected in England is clear to everyone who knows something of the experimental weapons turned out during the last two or three years. Enough is known to justify the assertion that aircraft which venture into the effective zone of A.A. fire in any future campaign will have a warm time of it. Bomb dropping at sea is all very well when the target cannot hit back; but in the next war every important ship will carry a battery of high-angle guns which, efficiently served, should be able to keep aircraft at a height too great to offer much chance of accurate bombing.

Details of new anti-aircraft equipment supplied to the American forces have lately appeared in the service papers of that country. The *Coast Artillery Journal* gives a description of two guns which have been tried with promising results. The first is a 3-inch piece with the following characteristics: Projectile, 15 lb.; muzzle velocity, 2,600 ft. per sec.; maximum horizontal range, 17,800 yards; all-round fire, elevation from minus 5 deg. to plus 80 deg.; operation by either a direct or an indirect fire control system; pneumatic loading device. The second gun is of 4.7-inch caliber, with characteristics similar to those of the light weapon, save that it fires a 45-lb. projectile, with a maximum range of 20,250 yards. Both guns are on motor carriage mountings. Mechanical fuse setters and fuses of an improved type are in process of development for the projectiles of these guns.

The 3-inch gun weighs seven tons and can fire fifteen shots a minute, this being also the maximum rate of fire for the 4.7-inch model. Both guns are semi-automatic. Heavy machine-guns, of a new pattern, are being supplied to the Navy and Army for use against aircraft. The standard models are .50 and 1-inch caliber respectively. The former has an effective vertical range of 12,000 ft., and can get off 500 shots a minute. Tracer ammunition for this gun is visible up to 7,500 ft. The very latest type of machine-gun is a 57-mm. weapon, with an effective range of 27,000 ft. It is proposed, says the *Army and Navy Journal*, to group four of these guns on one mount, having a single telescopic sight for all, and so to constitute a miniature battery, controlled by one gunlayer, and capable of discharging 400 to 500 rounds per minute. The same authority refers to trials with the new 60-inch Sperry-Dishpan searchlight, which is said to have given marvellous results. This instrument throws an effective beam of light up to 18,000 ft., varying in width from 600 to 1,800 ft. "With such a ray an aeroplane traveling at the rate of 100 miles an hour would require almost twelve seconds to go through the beam," thus giving the A.A. gunners time to range on the machine.

For the one-pounder A.A. guns, or pom-poms, mounted in American war-ships, an adjustable time fuse has been devised. Efforts are now being made to produce an automatic fuse-setting mechanism which will rapidly set the fuse of each shell just before it enters the gun. Fitted with this apparatus the one-pounder gun could set up a continuous bursting point in space. By a regulating handle on the automatic fuse-setter the gunner could control the range of the bursting point as readily as the azimuth of elevation. "He can thus move the bursting point at will in the three dimensions of space, and continuously pursue the aeroplane. Such systems of control are described in various patents. In general they give a more definite and accurate indication of the lead, and also increase visibility and permit engagements to open at longer ranges. In addition, the danger space of a shell having a time fuse is much greater than one that can only operate by impact, and, of course, much greater than that of a non-explosive projectile."*(Coast Artillery Journal.)*—Hector C. Bywater in *Naval and Military Record,* 15 August, 1923.

NAVIGATION AND RADIO

New Nantucket Lightship.—Last week the Lighthouse Service placed a new light vessel on Nantucket Shoals. This is probably the most important lightship station in the world, as it is a mark steered for by nearly all trans-Atlantic vessels; it is also one of the most exposed stations, as the vessel is anchored forty-one miles from land, in the open Atlantic south of the great area of shoals which it guards. The vessel was built by the Bath Iron Works.

The new vessel was specially designed and equipped for this station. It is equipped with a radio fog signal, an automatic apparatus sending during fog a group of four dashes every thirty seconds, enabling vessels with radio direction finders to obtain an accurate bearing from a distance of thirty miles or more in any weather conditions, and to steer for and "make" the lightship. The lightship has a powerful steam whistle and a submarine bell. A little later a submarine oscillator, a more powerful electrically operated signal, will be substituted for the bell. An electric signal light of 30,000 candlepower sixty-five feet high and visible at a distance of fourteen miles will show at the masthead four occultations a minute. There is radio equipment for communication, with a radio operator in attendance, valuable for reporting vessels in distress.

The vessel has oil fuel, and water tanks of sufficient capacity to remain on station for one year, thus eliminating the difficulty and expense of coaling a lightship. The vessel is provided with propelling power for safety and to enable it to return to the station. It is a small craft considering its exposed station, being 132 feet long, and 775 tons displacement. It is anchored in thirty fathoms of water, but is moored with a scope of 120 fathoms of chain.—*The Nautical Gazette,* 1 September, 1923.

Kite Balloons for Ships' Boats.—In a recent communication to *Engineering,* P. H. Sumner, late a staff officer of the British Air Ministry, calls attention to the desirability of equipping ships' boats, or at least a good percentage of them, with wireless. Had the survivors of the ill-fated *Trevessa* only had some means of communicating independently of their ship they could have been quickly located and been spared their month's arduous voyage in open lifeboats from the scene of the vessel's shipwreck to shore.

The writer therefore suggests that ships' boats should be equipped with a small kite balloon capable of reaching an altitude of some 200 feet, the captive wire to serve as an aerial for wireless from an open boat at sea.

The small balloon could be folded or rolled up and stowed away, occupying no more space than a suit of oilskins. The weight complete with 200 feet of flying wire would be about eight pounds.

Charging the balloon with gas would be a simple operation and would require little time, as a cylinder or bottle of compressed hydrogen, or the non-inflammable helium gas, could be used for filling purposes. The outfit would be compact, light and simple of operation. It would have distinct advantages over masts for wireless, which are liable to be smashed in a heavy sea, while aside from the great advantage of a high altitude and consequent increased range for transmitting, the balloon itself would attract the attention of passing vessels in the immediate vicinity.

A balloon twelve feet by four feet maximum diameter would be able to rise to a height of 200 feet. At that altitude it is in equilibrium: i. e. the weight of the balloon itself exactly equals the lift of gas so that it is practically a body independent of surface oscillations and conditions on the boat. Kite balloons have ridden out a gale of from seventy to eighty miles an hour. The flying wire or aerial would be wound on a small drum in a position at the lifeboat's stern, the balloon itself, upon inflation, paying off the wire as it rose.

A kite balloon is distinct from an ordinary special balloon. The latter cannot be flown with any stability in winds much above twenty miles per hour, the drag being so excessive as to give little or no increase of altitude as the captive wire is paid out. With the kite balloon we have a streamlined body (at once reducing drag) and a shape having an angle of incidence to the wind so that it makes use of a dynamic lift under the envelope, assisting its own gas-lifting efforts by kiting.

The balloon is required to fly with its nose to the wind and in order to obtain this condition, it is fitted with a rudder. This prevents spinning, as would be the case of a spherical balloon in a captive state. Two lateral rudders are also fitted at the stern. These prevent pitching and rolling. The three rudders are a means of stabilizing the balloon.

Independent of wireless, a balloon might be of use for flag signaling purposes only. A distress signal flown at a high altitude would be observed at a great distance. The morale among passengers obliged to take to lifeboats in an open sea would be considerably improved since they would realize that their chances of succor had been considerably enhanced by the fact that their plight was being communicated from eyes, as it were, in the air some 200 feet above the sea. This is a proposition that should interest the large steamship companies.—*The Nautical Gazette*, 18 August, 1923.

Proposed New "S. O. S." Call.—For a long time past it has been realized that some improvement on the "S. O. S." distress signal call was desirable because the letters occurred in many ordinary messages. With a view of replacing the existing call by automatic wireless signals that will ring alarm bells on other ships within reach, important tests have been carried on by the British Post-office and the Marconi Company. According to an official of the latter in attempting to bring out an automatic signaling apparatus, two main principles have to be considered—the certainty of action by the instrument used and freedom from responding to false calls.

For some time it was a question of whether the distress call should be one long dash, or a series of dashes of definite length broken by stops of definite periods. The last form of call is now considered to be the more practicable, as it is less liable to be affected by atmospherics or interference from other ships signaling at the same time. The signal giving the best results is a four-second dash, repeated three times at intervals of one second. The whole operation is done automatically by the wireless operat-

or simply pressing a key. Only when the full signal is given is the alarm bell rung.

The apparatus used has been found singularly free from registering false calls, because the timing must be accurately adjusted. Tests show that the new signal can be used over a distance of more than 100 miles, but there are possibilities of extending this to almost any practicable distance. One advantage of the new alarm signal is that it will enable small ships to carry one operator with safety, as the alarm bell will ring whether he is on or off duty.—*The Nautical Gazette*, 25 August, 1923.

WHAT S. O. S. MEANS.—What do the letters SOS, used by ships as a distress call, stand for? The answer is given by Jack Binns in the New York *Tribune*. It is simple, but in view of the general aptitude to assign a catch phrase to any arbitrary group of letters, a simple answer will not suffice the average person. In this case, we are told, the letters are associated with the cry "Save our souls!" so far as the public is concerned, while the call CQD, which it superseded, meant "Come quick, danger!" to the layman. Says Mr. Binns, as quoted in *The Radio World* (New York):

"As a matter of cold fact, neither of these two phrases is correct. Unfortunately, it is the truth that both groups of letters were adopted as a matter of expediency and not because of their peculiar susceptibility to dramatic interpretation. The original CQD was arrived at by the ordinary process of evolution in the detail work of communication, while SOS was an arbitrary adoption of the first international radio telegraph convention.

"The story of the distress call has never been adequately told, and in view of the large number of questions that have been raised on the point I am going to outline in this article the history of the famous calls.

"When wireless telegraphy was first placed into commercial use the ordinary telegraph and cable had been in operation several years and had reached a high state of development. The operation of the latter system was governed by an international convention which periodically laid down rules to meet necessary operating requirements.

"Among these rules was a series of double letter symbols which were used by operators to facilitate the working of special circuits, and these symbols invariably incorporated the letter Q because it is one of the least used letters in the alphabet, and in the Continental code its dots and dashes are distinctive. In these various groups there was the signal CQ. This was used on telegraph lines where more than one station was on the line, and it meant that the operator sending the call wanted every station along the line to listen to what he was about to say.

"Now most of these operating symbols were adopted by Marconi's new company when it began commercial operation at sea in the year 1902. The call CQ particularly adapted itself to wireless use, because any ship hearing the call would answer and thus establish communication with the ship making the call.

"As the system gradually developed there were a number of minor emergency calls made and it was quickly observed that the call CQ was not of sufficient distinction for emergency purposes. As a result of these experiences, the following general order, known as 'Circular No. 57,' was issued by the Marconi Company on January 7, 1904:

"'It has been brought to our notice that the call 'CQ' (all stations), while being satisfactory for general purposes, does not sufficiently express the urgency required in a signal of distress.

"'Therefore, on and after February 1, 1904, the call to be given by ships in distress or in any way requiring assistance, shall be 'CQD.'

"'This signal must on no account be used except by order of the captain of the ship in distress, or other vessels or stations transmitting the signal on account of the ship in distress.

"'All stations must recognize the urgency of this call and make every effort to establish satisfactory communication with the least possible delay.

"'Any misuse of the call will result in instant dismissal of the person improperly employing it.'

"This is the exact wording of the famous general order as issued. The original is now framed, and exhibited as part of the important archives of the Marconi Company. It was superseded in July, 1908, by the adoption of the call SOS as a distress signal by the International Radio-Telegraphic Convention.

"The call SOS is purely arbitrary in its grouping of letters and was chosen because of the unusual combination of dots and dashes which make it distinctive above all other calls. It consists of three dots, space, three dashes, space and three more dots."—*Literary Digest*, 15 September, 1923.

KILOCYCLES.—The term "kilocycle" will eventually supplant "wave-length" in the jargon of the radio fan. The U. S. Bureau of Standards has approved it. Abbreviate it *kc.* The frequency will be expressed in thousands of cycles per second—in other words, kilocycles. To transmute wave-lengths to kilocycles, divide 300,000 by the number of meters, or to obtain meters, divide 300,000 by kilocycles.—*Time*, 20 August, 1923.

MISCELLANEOUS

RUSSIA.—An American correspondent to whom I am indebted for several previous notes on Russian naval affairs now writes: "Although a naval fund equivalent to 12,000,000 dollars has been voted by the Council of Defense and subscribed by popular effort, no definite steps have been taken to carry out the program of fleet expansion which has been so much advertised by the Moscow newspapers this year. Official journals like the *Pravda* and *Isvestia* now state that a considerable portion of this money may be diverted from the Navy and used to strengthen the air force, for which Trotsky and his colleagues show great enthusiasm. Further reflection seems to have convinced them that air power would, from their point of view, be a better investment than sea power. With a large fleet of aircraft they would be able to dominate all their weak neighbors, on land as well as at sea, whereas the small squadron of cruisers and torpedo-craft which it was originally proposed to develop would have a very restricted political value in the Baltic and still less in the Black Sea. Consequently the program is likely to be modified. The one naval project that appeals to Soviet politicians generally is the commissioning of a fine new cruiser that shall worthily show the Red flag in foreign ports. For this purpose a ship of the *Svietlana* class is to be completed as quickly as possible, and when ready for sea will be dispatched on a long cruise to European and Asiatic ports. She will be manned by a picked complement, which is already receiving special training in the naval schools. Officers and men have been selected on the basis of 'high moral character, physique, and attractive personal appearance,' and a new outfit will be presented to each member of the crew before the voyage begins. Special attention is being paid to the quality of the workmanship in the vessel itself. It will sail from Kronstadt in all the glory of fresh paint, highly polished brightwork and new bunting. The whole scheme sounds rather Gilbertian, but the political idea behind it is rational enough. Among the ports of call mentioned in the provisional itinerary are Stockholm, Kiel, Hamburg, Leith, Gravesend, Cherbourg, Lisbon, Marseilles, Genoa, Indian, Australian,

and Japanese harbors. It remains to be seen what answers will be returned by the various governments when they are requested to offer the hospitality of their ports to a Bolshevist warship which is avowedly engaged on a propaganda cruise."—Hector C. Bywater in *Naval and Military Record,* 22 August, 1923.

HOLLAND.—Great public excitement and mystification were reflected in the Dutch press, beginning in the third week of July, over the sudden decision of the Ministry to push the Navy bill through Parliament as soon as its current recess should be over, in order that the bill may go into effect in January, 1924, as a naval program. The avowed object of this program is defense of the Dutch East Indies. Without divulging all its reasons for this sudden resolve in the face of financial difficulties, the Government is understood to regard with alarm the British decision to fortify and establish a great naval base at Singapore.

The Dutch Naval bill, which proposes a fleet consisting mainly of fifty submarines, based on fortified ports, with aircraft and bases, had been under discussion for eighteen months or more, but has been continually postponed because of the expense involved. A special commission appointed to examine the bill finally pronounced it the minimum which was possible for the defense of the Netherlands and her colonies. Both the Netherlands and the Dutch East Indies have been going through a business depression. On July 19, the Finance Minister, Jonkheer de Geer, who went into the Cabinet on an economy program resigned in despair when confronted by the prospect of raising money for the proposed fleet when money is so scarce. But the Government has resolved to push the bill through notwithstanding strong opposition in Parliament, especially from the left wing.—*The Current History Magazine,* September, 1923.

WORLD POWERS SPLIT ON ARMAMENT ISSUE.—Geneva, September 14.—The question of world armaments, first broached at Versailles, and continued in Geneva, Paris and London, is still being discussed in the third commission of the League of Nations. The question has grown like an avalanche, until it now comprises many problems, which might be separated as follows:

1. Whether to reduce or limit armaments.
2. How to harmonize reduction or limitation with national security.
3. Should the guaranty in treaties be general, covering all states, as does the pact of Versailles, or should the end be attained by a series of local alliances or agreements?
4. Should armament treaties be a development of Articles 10, 8, 12 and 15 of the pact?

Senõr Clark, Brazil's representative, in an address took the position that limitation of armaments was preferable to an attempt at reducing them.

Some Suggestions Made

"How can we discuss reduction of armaments," he inquired, "when countries like those of South America, particularly Brazil, neglected the Army and Navy program arranged before the war because the countries live at peace, although their armaments are not at the minimum provided by the pact for national security. Limitation would be preferable to reduction."

Lord Robert Cecil suggested using the phrase "limitation or reduction" of armaments.

Denmark came out for a reduction, protesting that Denmark came into the league desiring a reduction of her armament burden. The Danish delegate said he feared the suggested "treaty of mutual assistance" might split the league into opposing parts.

The Norwegian delegate, Lange, said he was opposed to a treaty, since the pact provided for a reduction of armaments and a system of arbitration and conciliation. Hence, he argued, a treaty was unnecessary. He feared the treaty would mean a return to the idea of *si vis pacem para bellum.*

England and France Express Views

Lord Robert Cecil seems to support the idea of a general treaty.

"As to the question whether agreements to a reduction or limitation of armaments should be an integral part of the mutual assistance treaty, or whether a guaranty of security should be given by the League of Nations," he said, "some states might consider a guarantee necessary and want it included in a general treaty."

Both the French and Hungarian delegates expressed the view that the states could not engage themselves as regards all other states, and that Article 15 of the pact was sufficient. The Canadian proposal for amendment of Article 10 was mentioned, but not discussed.

From the debate one gathers the impression that France, Italy, Hungary and Poland oppose a treaty of mutual assistance in general form, as suggested to be attached to the reduction or limitation convention, while Great Britain is pushing the idea of a general treaty.

The French seem to favor a series of local agreements, all covered with a roof provided by a mutual assistance treaty. It seems Great Britain would prefer a general treaty obligating all states equally. The smaller states, made nervous by the Italian-Greek conflict, seem to be rallying to Great Britain.

(Copyright, 1923, by Chicago *Daily News.*)—Baltimore *Evening Sun,* 17 September, 1923.

Chinese Students Sail for America.—That America continues to be the teacher of a selected group of young Chinese is indicated by the embarkation at Shanghai, on one steamer, of one hundred seventy-three Chinese students bound for America. The party includes five girls—a proportion which we may hope will later be increased—and these students from one of the oldest civilizations in the world will be distributed among forty American colleges. The expenses of eighty-two of these will be paid by the United States, as the expenses of many hundreds have been defrayed in the past, through the remission of our share in the so-called Boxer indemnity imposed on China by the Powers more than twenty years ago. The others will look to private funds to support them in their student days in American colleges and universities.

It will be a source of general satisfaction that the Chinese, in spite of the dissension and the discord that prevail in their household, have the good sense to continue to send, as they have for several decades, each year a group of students to study in our colleges and universities. Many of those who have come to this country in the past, to study the civilization and the culture of the West, are today counted among the leaders in the work of unifying China, and of arousing in the Chinese people a realization of the responsibilities of nationhood. The roll of these, however, is too small to have had much effect upon the inertia of the great mass of their countrymen. Hence the importance of adding as many more as possible to the band of China's educated leaders. Though the times are gloomy, though China apparently is a prey to the forces of disunion, the clouds may lift sooner perhaps than we now think possible. With the dawning of this happier day, the one hundred seventy-three representatives of Young China now on the Pacific will find that a great opportunity lies waiting for them in the land of their birth.—*Boston Transcript,* 22 August, 1923.

CANAL HAS PAID FOR ITSELF MANY TIMES.—New York, August 27.—The Panama Canal is operating at such a big profit that it has paid for itself many times over, said Colonel Jay J. Morrow, governor general of the Canal Zone, who arrived on the *Sana Ana* today. Governor Morrow will confer with officials at Washington. During the first fif een days of August according to the governor more than $1,000,000 in tolls was received.—*Boston Transcript,* 27 August, 1923.

OCEAN BED RISES TWO MILES, BROKEN CABLE REVEALS.—London, August 22.—Officers of the Eastern Telegraph Company's ship which is repairing a broken cable between St. Helena and Capetown report that the ocean bed has risen to within three-quarters of a mile of the surface at a point where the chart showed the depth to be three miles. The soundings for the chart were taken in 1899, the year in which the cable was laid. The discovery suggests that there has been a recent submarine convulsion.—*Boston Transcript,* 22 August, 1923.

THE SHELLING AT CORFU.—The many friends of Italy in this country will be the first to condemn the arbitrary act of the Italian naval commander at Corfu in shelling what was virtually an unfortified town, with the loss of a score or more lives, mostly helpless children. This high-handed and altogether uncalled-for act is unworthy of the nobler traditions of the land of Cavour, of Garibaldi, and Mazzini. It was one of those deeds that strike at the very heart of civilization; it is the method of mediæval warfare at a supposed time of enlightenment. As a member of the Society of All Nations, America cannot fail to be shocked at the unnecessary slaughter of these non-combatants.

The details of the attack, as given in a special despatch to the New York *Herald,* and published in today's issue of that paper, show that the action of the Italian naval commander was indefensible. The Italian naval squadron, consisting of dreadnaught cruisers, five cruisers, and twenty smaller warships, arrived in Corfu harbor at four o'clock in the afternoon. At twenty minutes past four the Italian admiral sent an officer ashore with an ultimatum to the Prefect demanding that he surrender the city unconditionally by five o'clock the same afternoon. Notice was also given to the consular officers of the various Powers that they should immediately gather their subjects at a given place with their respective flags over each group. The British consul only received his notice ten minutes before the expiration of the half-hour's grace allowed by the Italian ultimatum. The Prefect forthwith accepted the Italian terms, which called for the hauling down of the Greek flag flown from the old Venetian fortress at Corfu, but asked for a further respite in order that he might have time to notify the garrison commander and other authorities in the town. This request was refused, and at five o'clock the naval vessels began the bombardment of the fortresses. Since the Turkish-Greek War, only two hundred Greek soldiers have been stationed here, and the barracks built by the British during their occupation of the island from 1815-64 have been occupied by the Lord Mayors Fund Orphanages—the occupants of which are child refugees from Asia Minor, together with some six thousand other refugees. The new fort is in charge of the British Police Mission, and is now used as a police school. Although the Prefect, according to the despatch, informed the Italian authorities that the barracks were occupied only by refugees, he nevertheless gave the order for the bombardment of the forts. Shrapnel from the Italian guns, reports Colonel Stephen E. Lowe, member of the Red Cross, and attached to the Near East Relief at Corfu, killed twenty of these refugees, sixteen of whom were children.

Such is the act with which Italy has set out to collect reparations from Greece for the murder a week ago on Greek soil of the five Italian members of the Albanian boundary commission. She does not add to the validity of her claim against Greece by using the guns of her Navy against the homeless waifs who have now found a temporary refuge at Corfu.—*Boston Transcript*, 4 September, 1923.

VESSEL'S BOTTOM FOUND IN EXCELLENT CONDITION AFTER THIRTEEN YEARS' IMMERSION IN SEA WATER.—The training ship *Exmouth* is a steel vessel built by Vickers, Ltd., at Barrow-in-Furness about twenty years ago to the plans and specifications of Professor Sir John H. Biles, and in form and appearance is similar to our old wood line-of-battleship. After having been afloat without docking or repainting for thirteen years the vessel is at present in dry dock at Tilbury.

With the exception of the *Great Eastern*, which, owing to her great size, was unable to obtain a dry dock from the time she was launched to the time of her destruction, this seems to be approaching a record for a vessel to be afloat without docking. Despite this thirteen years' immersion, the bottom of the ship was in excellent condition. The hull was treated in the following fashion:

When she was first launched no paint had been applied and she lay in the water at Barrow-in-Furness for some weeks while being fitted up. During this time the sea water had an opportunity of destroying the millscale on the plates of the vessel. She was then towed to the Thames and placed in dry dock, when her bottom was thoroughly cleaned with wire brushes and fresh water, and the following paints were applied: One coat of Holzapfel Danboline paint; one coat of International priming; two coats of International anti-fouling.

These compositions were applied eighteen years ago, whereupon the vessel took up her station in the lower reaches of the Thames, remaining afloat for five years. After that time she was again placed in dry dock when her bottom was found to be in a state of good preservation. On this occasion she was recoated with two coats of International priming, and two coats of International anti-fouling. Since that time she has been afloat for thirteen years and is now in dry dock with the result stated above.

It is considered that the formation of the millscale during the manufacture of steel plates is a cause of serious corrosion. This millscale is formed, to a large extent, by the sand which is thrown on the plates during the process of rolling, in order to enable the rolls to have a proper grip. The silica of the sand then appears to form an integral part of the plate. On naval vessels this millscale is removed by dipping the plates into a hydrochloric acid solution which is subsequently neutralized, and in this process the silica is removed. This method, however, has been deemed too expensive for merchant vessels.

Removal of Millscale

A. C. Holzapfel, in a paper which he read before the Institution of Naval Architects about twenty-two years ago, advocated that ships should be launched without paint in order that, while the ship was fitting out, and during the exposure of the bottom to the action of the sea water, this millscale might be removed. Professor Biles accepted this proposal in the case of the *Exmouth*, and it must be admitted that his judgment has been amply justified. Merchant ships, however, almost invariably receive a coat of paint to the bottom on the stocks in the usual way.

Six months after going to sea, owing to vibration, also to unequal expansion and contraction, about half the millscale has probably fallen off,

taking the paint with it. The vessel is then placed in dry dock, superficially scraped and repainted. In many places, however, rust cones have formed during the six months which have elapsed, and a superficial scraping of these does not remove the whole of the rust down to the true surface of the steel. The result is that paint is applied over rust. Six or nine months later the vessel is again docked, more millscale has fallen off and she is again repainted in the same way. The rust, therefore, which has remained underneath the paint, continues to spread and results in the gradual formation of a thick layer of scale, which, after ten to fifteen years, has to be removed with scaling hammers, involving a considerable delay and expense to the owners.

Moreover, a vessel whose bottom is covered with scale has a rough surface and loses speed in consequence. From the experience of the *Exmouth*, it would appear that all this could be avoided by following the method which Professor Biles adopted in regard to the *Exmouth*, in which case a permanent and sound protection of the outside surface of the bottom plating could be secured.—*The Nautical Gazette*, 25 August, 1923.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"Making America Independent in the Air." Editorial in *Mechanical Engineering*, September, 1923.

"Tables and Diagrams for Water Vapor Computed on the Basis of its Specific Heat," by Dr. Oscar Knoblach, E. Raisch and H. Hauser, in *Mechanical Engineering*, September, 1923.

"Interpretive Summary of Papers Read Before the International Air Congress, London, 1923," in *Aviation*, 27 August, 1923.

"Complete Description of the U. S. S. *Langley* and the U. S. S. *Richmond*," in the *Journal of the American Society of Naval Engineers*, August, 1923.

"Changing Methods in Submarine Warfare," by Admiral W. S. Sims in the *Current History Magazine*, September, 1923.

"The Epoch Making Night Mail Flights," Editorial and "The Aeromarine Night Mail Plane," Editorial, *Aviation*, 3 September, 1923.

"Accurate Methods of Aligning Steam Turbines; Taking the Sag out of a Tight Line," by Edgar G. Barker, Sr., in *Power*, 4 September, 1923.

NOTES ON INTERNATIONAL AFFAIRS

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. NAVAL ACADEMY

FROM AUGUST 23 TO SEPTEMBER 23

ITALY IN THE ADRIATIC

ITALIAN SEIZURE OF CORFU.—Following the assassination of Italian members of the commission engaged in establishing the Greek-Albanian frontier, Italy dispatched an ultimatum to Greece demanding an immediate investigation and payment of an indemnity amounting to about two million dollars within five days. The Greek reply on August 31 was declared unsatisfactory, and Italian naval and military forces proceeded at once to occupy Corfu and other small adjacent islands. A full Italian Army Corps was subsequently landed at Corfu.

The accompanying proclamation declared that by her occupation of Corfu Italy had no intention of committing an act of war but was only seeking "to safeguard her prestige and manifest her unshakable determination to obtain the reparation due her in conformity with custom and international law."

SETTLEMENT BY COUNCIL OF AMBASSADORS.—In the crisis aroused by the seizure of Corfu, and while the League of Nations Council was discussing its ability to intervene, the Council of Ambassadors of the Allied Powers at once undertook measures to secure a peaceful settlement of the dispute. Greece on September 9 replied to a note from the council indicating her willingness to accept such terms of settlement as might be laid down, and on September 19 in Phalero harbor fired salutes of twenty-one guns to Italian, British, and French naval vessels, in part fulfilment of the measure of apology prescribed.

The Council of Ambassadors further dispatched a commission to supervise the investigation undertaken by the Greek Government to secure and punish those responsible for the crime. It was agreed that upon the commission's report that Greece had fulfilled this part of her responsibility, the question of the amount of indemnity should be referred to the Hague Court. On the other hand if the Greek action were unsatisfactory, Italy would be free to demand an additional fifty million *lire* for the costs of occupying Corfu.

Italy, after strong pressure from France and especially Great Britain, agreed to evacuate Corfu on September 27, without awaiting full compliance on the part of Greece.

INTERVENTION BY LEAGUE.—At the time of the Corfu crisis there was vigorous agitation among the delegates at the League of Nations Assembly and Council in session at Geneva for assertion of the League's right to intervene to prevent war. This right Italy denied, declaring that no act of war had been committed, and that the questions involved should first go before the Council of Ambassadors as the body which had appointed the commission to settle the Albanian frontier in execution of the Treaty of Versailles. After a stormy secret session of the Council on September 20, it was decided that, without direct reference to the Italo-Greek dispute, the following three questions should be submitted to the World Court:

First—The degree to which a State is responsible for crimes committed in its territory.

Second—How far the League is competent to take an attitude in an international dispute which is already engaging the attention of a separate body such as the Conference of Ambassadors.

Third—How far a State which is a member of the League has the right to take coercive measures against another member, or whether this is not the duty of the League alone and as a whole.

EFFECT ON LEAGUE OF NATIONS.—What has happened, of course, has been the application of strong pressure by France and England upon Mussolini—pressure he dared not withstand. He had already insisted that he could not accept the interference of the League of Nations, and to save his face, the League's terms of settlement—terms which involved a compromise of the usual sort—were put forward by the Council of Ambassadors. This also suited the French plans exactly. France feared the creation of a precedent of League action which Great Britain would use against her on behalf of Germany. As for the British, they were willing to get the matter settled on any terms which would prevent war and leave the League intact. Practical statesmen like Lord Robert Cecil looked at the realities of the situation. France, with the unhappy acquiescence of Great Britain, rules Europe today. France and England are the force behind the League of Nations, just as they constitute the strength of the Council of Ambassadors. In the British view, it does not at present matter very much by what machinery war is averted, provided the League is not too publicly revealed as impotent.—*New Republic*, 19 September, 1923.

THE DILEMMA OF BRITISH FOREIGN POLICY.—Consider the degree of British isolation. It can hardly be denied that today France exercises a military hegemony much more complete than that which in the past provoked British resistance in the shape of wars lasting generations; that Belgium and other small states, defense of whose rights figured so enormously in the emotions of the British during the war, now make common cause with France; that Turkey, defeated and prostrate as she was at the time of the armistice, has since been able successfully to defy Great Britain; that Italy by the occupation of territory which was recently a

British protectorate now takes steps which may well be the beginning of naval domination of the eastern Mediterranean, and which in the old days Great Britain would never have tolerated for a moment; and that in the direct Franco-German negotiations now begun Great Britain is ignored.

Lloyd George summarizes the situation by the statement that Great Britain has not withdrawn from the Continent but has been pushed out amid the sniggers of the world. Add to the ex-Premier's statement the significant fact in relation to the forces which the government has had to consider during the last year, that the papers of all three of the great newspaper trusts in England rejoice at the discomfiture of the League and bitterly blame the government.

One policy urged by part of this opposition has naturally gained plausibility by recent events. The policy in question is what its protagonists term the "American policy" of washing our hands entirely of the Continent to the extent of formal withdrawal from Cologne, etc., and devoting all energies to our overseas empire, letting Europe stew. But obviously a policy of complete isolation and intensive imperial development must include one of thoroughgoing imperial defense based on the maintenance of naval preponderance with coaling stations, open lines of sea communications, etc. The two things always have and inevitably must go together. We could not tamely see, for instance, naval control of the Mediterranean pass from our hands, or our position in Malta, Gibraltar and Egypt threatened; and thus we should be compelled to meet in some way the growth of Italian imperialism. The preservation of naval supremacy which any intensive imperial policy involves means now—in these days of air power, more than ever—continental alliance. Isolation from Europe for a world-wide empire or commonwealth having its center in Europe is a clear impossibility.

The other alternative urged by the very considerable forces in England which oppose the government's present foreign policy is to share the French hegemony and co-operate in the more or less permanent subjugation of Germany.—*New Republic,* 19 September, 1923.

RENEWED DISPUTE OVER FIUME.—In the midst of Italy's dispute with Greece, peace in the Balkan region was further threatened by a sharp note from Italy to Jugoslavia over the status of Fiume.

By the Treaty of Rapallo in 1920 Fiume was made a free state, and its eastern suburb of Susak was given to Jugoslavia for use as a port. The treaty, however, left uncertain the exact boundary line between the free state and Jugoslavia, and especially the ownership of Porto Baros, which contained harbor facilities near Fiume. On August 31 a compromise agreement was reached by negotiations between Italy and Jugoslavia in accordance with which Fiume and the district in dispute were to be administered by a joint commission on which Italy, Jugoslavia, and the free state were all represented.

Immediately thereafter, Premier Mussolini sent a demand to the Belgrade Government that unless this agreement were ratified within fifteen days Italy would be free to take such steps as she thought fit.

The Fiume local government resigned on September 16. Italy did not formally annex Fiume, as was expected, but sent General Giardino, third in command of Italian armies, to act as military governor. Assurances were given to the powers that this was only a temporary measure, and a

new invitation was sent to Jugoslavia to send delegates to Geneva for further conferences over the question.

MUSSOLINI'S POLICY.—As to Fiume, the anxieties of Italy are comprehensible. The city bears an Italian name and is populated largely by Italians. The only broad gauge railroad through the mountains to the Eastern Adriatic coast has its terminus there. Croat dominion there would be naturally unsatisfactory to Italy, and the opening of the new Jugo-Slav port nearby affords the Italian Government some reasonable excuse for asking for more than half-way powers at Fiume. But Mussolini's demand that the Jugo-Slav Commissioners accept his settlement in fifteen days or take the consequences was as harmful in tone as was the ultimatum to Greece. Nations, especially Balkan nations, do not enjoy being openly browbeaten.

The nervous Italian Premier, brooding amid the Napoleon books in his library, is making Italy a dangerous power to world security. The people of Italy had best put a curb on him. They are by no means unanimous in backing him. They still have an able opposition press. The best place to check him is at home.—New York *Times*, 6 September, 1923.

GERMANY AND THE RUHR

GERMANY ABANDONS PASSIVE RESISTANCE.—In a speech on September 12 Chancellor Stresemann definitely indicated the steps the new German ministry was willing to take to make terms with France. He practically admitted the failure of passive resistance in the Ruhr and presaged the withdrawal of government subsidies in support of this policy. Furthermore the Chancellor made more definite the nature of the guarantees based on private property which Germany would offer for payment of reparations. He proposed the formation of a trust company in which the Allies would be represented, to hold mortgages on all private property that could be disposed of abroad, the revenues from which could be used in making payments.

GERMAN REPARATIONS PROPOSAL.—Berlin, September 13.—Chancellor Stresemann today was waiting to see what France's response would be to his proposal in last night's speech, offering the allies a direct share in all German state and private industries.

This proposal represents the high point in Chancellor Stresemann's policy, and is an offer unprecedented in history. The German shares thus offered would be placed in the hands of the reparations commission, which would sell them in the international market for ready cash.

America, as the world's richest nation, doubtless will be a heavy investor. Hence, it is important to know the value of these pledges.

The state railroads before the war earned net profits of $250,000,000; private corporations and stock companies earned $400,000,000 net; state mines and forests, $30,000,000—a total of $680,000,000 a year under the best of conditions.

Chancellor Stresemann's twenty-five or thirty per cent participation would yield a maximum of $170,000,000 a year. The capitalized value of the shares offered equals only about one-tenth of the reparations sum demanded under the present schedule. At least ten per cent must be deducted from these figures for German territory lost in the peace settlement. Also it would mean several years before German industry could reach its pre-war prosperity.

Hence Chancellor Stresemann's offer is at best only a partial solution. It must eventually be supplemented by a readjustment of the reparations demands. Its immediate advantage to France and Belgium is that it would provide them with much-needed cash. Its advantage to Germany is that it would interest world investors, especially Americans, in German stability and prosperity and would guarantee to Germany an opportunity for development free from military or trade restrictions.

But it is precisely for this reason that the plan is opposed by a strong section of French opinion. The Germans see a conflict of interests in Paris, between those wanting reparations and those wanting to cripple Germany as a competitor of the new French iron and steel industry.

Meanwhile Germany at the edge of the abyss, is nervously awaiting the outcome.—Baltimore *Sun*, 13 September, 1923.

REVOLT THREATENED.—Berlin, September 22.—Chancellor Stresemann, believing his last days in office have come unless he takes energetic action, has called a meeting of the Cabinet tomorrow to approve the following program, which already has been agreed to:

First—Ruhr and Rhineland deputies, industrial and labor leaders, who have been summoned to Berlin, will be told on Monday that the Government is about to capitulate to France.

Second—The Premiers of the Federated States, who also have been called to the capital, will be told the same thing on Tuesday, and informed of the wishes of the people of the occupied areas. Premier Von Knieling, of Bavaria, may not answer the summons.

Third—Chancellor Stresemann will formally proclaim the abandonment of passive resistance in a speech before the Reichstag on Wednesday.

The Chancellor is fully cognizant of the risk he is running in lifting passive resistance without first obtaining Premier Poincaré's promise to free Germans imprisoned in the Ruhr, and to permit the return of those expelled.

M. Poincaré is standing firm on his announcement that he will conduct no negotiations whatsoever until passive resistance is formally abandoned.

The fate of the republic depends upon the support the Chancellor can rally after he makes his Reichstag announcement. The Nationalists think he will fall. They are ready to seize power and have secretly selected a directorate of five men, in co-operation with representatives of the reactionary People's party "to save Germany's honor" if capitulation in the Ruhr brings about the Chancellor's downfall.

The German Communist leaders, Heinrich Brandler and Herr Talmeyer, have arrived in Moscow and informed the Russians that the time for a revolution in Germany is ripe. They express themselves confident of their ability to obtain control within the German state, but they need the international proletariat against outside capitalistic enemies.—Baltimore *Sun*, 23 September, 1923.

SPAIN

MILITARY DICTATOR SEIZES SPANISH GOVERNMENT.—By a military *coup d'etat* on September 13 the Spanish Cabinet was overthrown and a dictatorship was established under General Primo Rivera, captain general of the military district of Barcelona. Following the resignation and flight of the Alcumenas ministry and the proclamation of military rule in Madrid, King Alfonso called upon General Primo Rivera to set up a military directorate.

The new government brought about the dissolution of parliament, declared for renewal of the Moroccan campaign, pledged itself to strict economy in government expenditures, and proclaimed a strongly nationalist policy for the future, including efforts for the recovery of Gibraltar for Spain. The reorganization in Spain followed the general lines of the Fascisti movement in Italy.

GREAT BRITAIN AND IRELAND

GOVERNMENT WINS IRISH ELECTION.—The election of a new Irish Parliament on August 27 resulted in the selection of only forty-four republican members out of a total of 153. Of the remaining 109 members sixty-seven are definitely pledged supporters of the present government. The new parliament met on September 19 and reelected Cosgrave president by acclamation.

BRITISH OPPOSE TWELVE-MILE LIMIT.—Washington, September 19.—British reply to Secretary Hughes' proposal for a reciprocal agreement on ship liquor and liquor smuggling was received at the State Department today and was described by officials as "in general, not sympathetic to the proposals." The British Government plans, however, to present the question to the British imperial conference which meets in London next month.

Apparently there is some hope in Washington that reference of the question to the imperial conference leaves a door open to ultimate negotiation of a treaty along the lines of that proposed by Secretary Hughes. In any event the State Department regards the matter as still in an indefinite state.—New York *Times*, 20 September, 1923.

LEAGUE OF NATIONS

INTERPRETATION OF ARTICLE TEN.—The work of the League of Nations Assembly during September at Geneva was accomplished chiefly in subcommittees, the full sessions being given over to speeches on current international questions. The time of the Council was primarily occupied by the problems raised by Italian action at Corfu and Fiume. In the assembly committee on amendments a resolution was adopted for presentation to the assembly which endeavored to give a clearer meaning to Article Ten of the League Covenant. The commission adopted a new compromise formula replacing the Canadian amendment. It begins by emphasizing the existence of a general desire for precision in the meaning of Article X and recommends that the assembly adopt several clauses in the form of a resolution.

The first clause is that in case the council of the league deems it necessary to recommend the application of military measures because of an aggression or a menace of aggression, the council will take into account the geographical situation and special conditions surrounding each state.

The second clause declares that it is the right of the constitutional powers of each member state to decide the nature and the extent of its obligation to maintain the independence and integrity of territory of members, and to what extent it should furnish military assistance.

The last paragraph reads:

"However, a recommendation given by the council will be considered of the highest importance and will be taken into consideration by all the members, with a desire to execute in good faith their engagements."

This interpretive resolution is generally regarded as removing any of the existing fears that Article X would force states too far into possible military adventures abroad without the sanction of the home parliaments.

WORK ON DISARMAMENT AGREEMENT.—Geneva, September 14.—The little Powers sustained a defeat today when in the Commission on Disarmament Norway's amendments to the proposed mutual guaranty treaty were voted down after both France and Great Britain had spoken against them.

Their purport was to compel the Powers in return for the mutual assistance of the little Powers to agree to the following:

First—To register all treaties and conduct an unaggressive foreign policy.

Second—To admit compulsory jurisdiction of the Permanent Court of International Justice.

Lord Robert Cecil combated both proposals, saying that such conditions make acceptance of the treaty well nigh impossible and that compulsory jurisdiction was not necessary anyway because the same results could be had by direct negotiations.

France also opposed the amendments earnestly, which brought a bitter retort from Christian L. Lange of Norway that the amendments had been offered in the names of the smaller Powers, which find the gulf between them and the league's big Powers constantly widening.

Although the proposed treaty for mutual guaranties, supposed to be the first real step in European disarmament, may be adopted in some shape, an indication of what will happen when it is put up to the Governments is afforded by the result of the amendments to the covenant which are already before them.—Baltimore *Sun*, 15 September, 1923.

UNITED STATES

RECOGNITION OF MEXICO.—Washington, August 27.—Virtual, but not actual technical recognition was accorded today to the Obregon Government in Mexico, when the State Department sent a communication to that Government, through our embassy in Mexico City.

This message, it is said, will leave no doubt in the minds of President Obregon and his advisers that full and formal recognition will soon arise out of the Payne-Warren negotiations with the Mexican Commissioners.

The note dispatched today, it is learned, was one of the preliminary exchanges to the actual granting of recognition and the technical restoration of diplomatic relations.—New York *Times*, 27 August, 1923.

OPEN DOOR IN TANGIER.—Washington, September 20.—The United States Government has sent identical notes to Great Britain, France and Spain urging that the principle of the open door, or equal commercial opportunity, be observed in the settlement of the Tangier question.

While the difficulties confronting France, Great Britain and Spain with respect to Tangier are ostensibly economic, having to do with the question of port duties and trade privileges, the conference has had an undercurrent of international politics which has made it of much greater importance than has generally been admitted. The city of Tangier, located almost opposite Gibraltar, has been recognized by military authorities to

be of vast strategic importance, and especially since the development of the submarine during the World War it has been recognized that a submarine base at that point would menace Gibraltar as the key to the Mediterranean.

Notwithstanding the ostensibly international status of Tangier, there has been much dissatisfaction on the part of Great Britain because of the great influence exercised over the district by the French. This influence, it is stated, arises from the fact that the Sultan of Morocco is the nominal head of the Government of Tangier and the French, because of their dominant position in Morocco have been able to exercise great influence over the Sultan. It has been charged that France is endeavoring to nullify the internationalization arrangement and set herself up as in absolute control of Tangier, and the further charge has been made that she wishes to do this in order to be left free to establish a submarine base which would control the Straits of Gibraltar and hence the Mediterranean.

The United States Government, despite its action in sending a note to the interested powers, is carefully refraining from meddling in the political aspects of the situation.—New York *Times*, 21 September, 1923.

FAR EAST

NEW JAPANESE MINISTRY.—Tokio, August 28 (Associated Press).—Count Gombei Yamamoto has been appointed Premier of Japan to succeed Baron Kato. The appointment followed a summons to court by Prince Regent Hirohito, who acted upon the advice of the Genro, or elder statesmen. The new Premier is proceeding toward the formation of a Cabinet which is expected to be completed soon.

The funeral of Premier Kato, who died last Friday, was held today.

Count Yamamoto ranks high in the political and social life of Japan. He was Premier from February, 1913, to April, 1914. He is an Admiral, retired. He was created a Baron in 1902 and a Count in 1907. The Count visited in the United States in 1907 as a member of the suite of Prince Fushimi. Count Yamamoto was born in October, 1852.

REVIEW OF BOOKS

SYNTHÈSE DE LA GUERRE SOUS-MARINE, Capitaine de Frégate Castex. Augustin Challamel, 17 Rue Jacob, Paris.

This book is especially timely in view of the present discussion regarding the relative value of capital ships and submarines. Commander Castex, at the very outset, states his opinion; he is neither an exclusive partisan of the submarine, nor yet would he detract from the great value of that type of vessel when operating conjointly with capital ships. In the average naval war, submarines are necessary; they must be energetically used, but it is futile to expect everything of them.

In his first chapter the author notes that history shows the peace of Europe to have been disturbed about once every hundred years by a despot, eager for glory; notably Charles V, Louis XIV, Napoleon and the Kaiser. In each case a coalition of nations, formed for protection against the despot, at first vastly inferior, finally grew strong enough to overwhelm him. Although the mastery of the sea has always been of prime importance to the despot, in no case does he seem to have realized this fact, or comprehended the importance of destroying the enemy's fleet. The despot has adopted the secondary method of preying upon commerce; and in the course of history the nation placing primary importance upon commerce destroying has always met with defeat. During the Revolution, her failure to gain the mastery of the sea left France shorn of her colonies, her coasts blockaded and her commerce paralyzed. And it was the same inability to obtain command of the sea that resulted in a like fate for Germany during the late war.

Commerce destroying is the antithesis of military warfare on the sea. Circumspect in character, despite numerous acts of extraordinary individual heroism, commerce destroying is not nearly so audacious as openly attacking the enemy. Modern inventions—the change from sail to steam, the cable, above all, the radio, have rendered the raider's task more difficult. To such an extent is this true that commerce destroying results in final victory only when used as an auxiliary measure to a vigorous attack on the enemy battle fleet.

At the outset of the war, Germany possessed a number of raiders in the form of fast cruisers, well distributed over recognized trade routes, and much damage was inflicted upon the allies before the sea was finally cleared of these vessels and Germany considered herself compelled to have recourse to the submarine, with its most valuable feature of surprise.

Submarine warfare, legitimately conducted, is not "piracy." In fact, it was foreseen by Admiral Aube and others of the so-called *jeune école*

as early as 1886. From a naval point of view the submarine campaign, in itself, was entirely justifiable; but some of the German submarine commanders often "smirched their colors by conducting the campaign with useless and stupid cruelty."

A number of good reasons are set forth to show that the submarine campaign was not premeditated. The intensive building campaign was not begun soon enough to indicate such an early decision. According to Commander Castex, at the beginning of the war Germany had only twenty-seven submarines; in the course of the war three hundred and twenty-two were completed. The decision to launch an intensive submarine campaign was brought about by a combination of circumstances. It was not adopted until February, 1915, and no very encouraging results were obtained for a year. Finally, in March, 1916, it was decided to make the campaign a ruthless one. This decision was arrived at only after numerous conferences; and, accordingly, Commander Castex infers that had the campaign been planned before the war, no such long debate would have been necessary.

The submarine's principal weapon against merchant shipping was the gun. For example, the *U-35*, cruising in the Mediterranean during June, 1916, sank forty-one vessels. Of these only two were torpedoed. Many vessels first reported "torpedoed" were afterwards discovered to have been sunk by gunfire. In fact, the efficiency of the submarine as a torpedo boat in this method of warfare was but mediocre; and at best its principal value was only against vessels of moderate speed.

Against the gunfire of the submarine the allies armed their merchant vessels. At first neutrals protested against admitting armed merchant vessels to their ports. Finally the United States proclaimed that merchant vessels had the right to arm for defensive purposes. Formerly this measure had been the rule, not the exception, as a defensive measure against pirate craft.

The armed guard developed rapidly in importance; schools were established for the training of merchant officers and frequent conferences were held, attended by officers of the navy and captains of merchant vessels.

The next step for the protection of merchant vessels sailing singly consisted in the inauguration of the patrol for shipping routes.

But the patrol method failed to afford adequate protection for shipping. As an example of this method, the Mediterranean was first divided into eighteen zones, four British, four Italian and ten French. At most there should be no more than ten miles between patrol vessels. This, allowing for reliefs, would necessitate three hundred and twenty vessels for the western Mediterranean alone. There must also be considered the eastern Mediterranean, the North Sea, the Channel and the Atlantic.

Then, too, patrol vessels by their very presence indicated to submarines the principal shipping routes. Thus the patrol method, while affording slight protection from attack by gunfire, actually facilitated attack by tor-

pedo. Moreover, the lack of uniformity in time and distance prevented concerted action between seaplane, surface vessel and patrolling submarine.

Finally the allies adopted the best method of meeting the submarine menace. This was the method of assembling merchant vessels in convoys and protecting each convoy by a suitable escort.

This system of convoy and escort was, of course, merely a revival of methods that had well stood the test of time.

First used in the war in connection with the transportation of coal across the channel, the method of escort and convoy proved so successful that it was soon adopted for all shipping in the channel and finally for ocean shipping.

The escort was a certain insurance from attack by gunfire from enemy submarines. Another great advantage lay in the fact that the escorting vessels went to sea only when there was a tangible unit to protect, thus dispensing with the monotony of the patrol.

Briefly, the advantages of the convoy and escort were adequate counter-offensive, secrecy of operation and concentration of forces. Moreover, it allowed for initiative of maneuvering, both tactical and strategical, and it permitted, if necessary, the rapid concentration of all forces, air, surface and submarine.

Its disadvantages were difficulty of station keeping on the part of the merchantmen and delay in the assembly of the convoy. But far better the slow passage of merchant vessels than the idea of having them all at the bottom of the ocean.

When the allies adopted these countermeasures, Germany conceived the idea of sending submarines to operate in more distant waters until finally these vessels were conducting successful campaigns in the Irish Sea, the White Sea, the Mediterranean and the Atlantic.

Increased radius of action, of course, necessitated increased tonnage, resulting in the evolution of the so-called "submersible cruiser." Witness the famous cruise of the *Deutschland,* leaving Bremen on June 14, 1916, arriving in Baltimore on July 16, 1916, with a cargo of merchandise, and returning to Germany by August 23, having cruised 4,200 miles, 100 of them submerged.

The successful cruise of the *Deutschland* demonstrated the fact that it was possible for submarines of this type to conduct operations at a great distance from their base. It was merely necessary for Germany to equip the submarine merchantmen *U-151* to *U-159* with guns and torpedoes and to build the large submarines *U-158* to *U-169.* The submersible cruisers *U-152, U-153, U-154* and *U-155* attacked a total of sixty-one allied vessels. Of these, forty-six were attacked with guns and fifteen with torpedoes. Six of those attacked with torpedoes were sunk.

At this point Commander Castex sets forth a carefully compiled and very valuable synopsis of the operations of all these submersible cruisers, with tables showing the duration of their cruises, the number of vessels sunk and other data of interest. At the conclusion of the chapter the

author demonstrates that the operations of the submersible cruisers were rendered less effective by the constantly increasing efficiency of the allied escorts and especially as a result of the measures adopted by the interallied naval council at London on January 22, 1918, which set forth in great detail measures organizing and standardizing convoy routes.

The author continues with an outline of the evolution of the submarine; formerly a relatively small vessel, capable of production in great numbers, it relied principally on the torpedo as a weapon. This type gradually developed into the submersible cruiser, large, costly and relying for its attacks against merchant shipping principally on gunfire.

In the German Navy there was a tendency to use the submersible cruiser and the battle cruiser in much the same manner. Instead of using them in conjunction with the battle fleet, the idea seems to have been to use them alone, to make them accomplish everything. But, in the war, Germany realized that nothing final could be accomplished except by sweeping the enemy from the sea by gunfire.

The relative value of the various offensive measures against submarines are next considered. A table sets forth the destruction of one hundred and ninety-two German submarines in the course of the war. The numbers destroyed respectively by gunfire, depth charges, mines, mystery ships and other methods are carefully tabulated. From a study of this table the author concludes that the destruction of enemy submarines about kept pace with the building. A curve of losses of allied merchant tonnage is valuable principally as a concrete illustration of the mistakes of the Allies prior to their adoption of the system of convoy and escort.

Before the German submarine campaign started in real earnest, the allied battleship fleets, based in the North Sea and the Adriatic, fully realized their mastery of the sea in all its details; the denial of the sea to the central powers, the suppression of their exports, the ruin of their overseas commerce. On the contrary, so far as the Allies were concerned, there was freedom of the sea with its assured source of constant supplies.

At the outbreak of the war no one questioned the supremacy of the battleship. As the war progressed, however, the constantly increasing activities of the submarines aroused doubt of this supremacy of the capital ship in the minds of officers as well as of laymen. This finally led to the popular conception that the battleship rested in security behind nets and booms while the anti-submarine navy, consisting of destroyers, patrol vessels and seaplanes vigorously attacked the enemy. The contrast imposed by the conditions of the war was so apparent that it is no wonder that many naval officers vacillated in their opinion in regard to the relative value of the capital ship and the submarine.

Apparently the battleships upon which so many millions had been spent were bottled up in their bases. As an actual fact, however, the battleship played a most important rôle in the war against the submarine. And it is a noteworthy fact that on the various occasions when it was rumored that

the German High Seas Fleet had left its base, all the Allied nations turned to the British Grand Fleet. On the other hand, it is perfectly evident that capital ships alone do not guarantee control of the sea. Smaller vessels have their place, although they must act in conjunction with, not independently of, the capital ships.

The Allies enjoyed a great advantage in that their capital ships were able to act in conjunction with the smaller vessels whereas the German battleships were unable to operate in concert with the submarines. And in great measure this state of affairs resulted in the eventual defeat of Germany.

In two theaters of war only were there exceptions to this rule; namely, in the Baltic and in the Sea of Marmora. It is noteworthy that despite individual exploits of great daring and brilliancy, British submarines, unsupported, were unable to gain control of either of these seas. There the Allies were compelled to make war in much the same manner as was forced upon Germany in the North Sea and the Atlantic Ocean. Fortunately the operations in the Baltic and the Sea of Marmora were not of such vital importance to the Allies.

In December, 1917, the German press stressed the axiom that warfare would never be successful without the support of the High Seas Fleet. A number of German naval officers strongly urged a sortie in force. But it was too late. "It is not without incurring a penalty that a nation keeps a fleet inactive. It deteriorates professionally and in morale. Even if hulls are kept in passable shape, even if the preservation of material is successfully accomplished, the mind and spirit of the personnel are not in accord." This state of low morale found its outward expression in the mutiny of October, 1918.

The World War also demonstrated the fact that, even in submarine warfare, control of the surface of the sea has been the essential requisite. It was control of the surface of the sea, always of paramount importance, that saved the coalition and the liberty of the world.

Naturally tactics were more affected than strategy by the development of the submarine. In a general engagement the presence of submarines should be anticipated anywhere in the theater of war; still there will always be certain positions in the battle area where their presence, together with mines, may be anticipated with a greater degree of probability. Briefly, submarines and mines combine to restrain an enemy's freedom of action at sea in much the same manner that fortifications serve to restrain it on land.

Submarines will greatly aid a force employing retiring tactics, and may even lead the victor over minefields, a veritable offensive though in defensive guise.

The forcing of a strait has been rendered by the submarine a maneuver attended by great danger and difficulty. This was clearly demonstrated in the Dardanelles campaign. On the other hand, the submarine affords an excellent means of destroying capital ships in the strait; witness Hol-

brook's brilliant stroke in diving beneath the minefields at the entrance of the Dardanelles and blowing up the Turkish battleship *Messudieh.*

Submarine warfare influenced hearty co-operation between navies and their respective merchant marines. The daily strife, abounding in instances that developed mutual understanding, demonstrated to these seafarers of different branches that their destinies were inevitably linked together; and this union in time of war clearly made for their better understanding and co-operation in time of peace.

Another result of submarine warfare can be traced in the development of weapons, both offensive and defensive, for example, the depth charge, hydrophone, boom for closing harbors, smoke apparatus and other devices of less prominence.

Weapons change; new types come into existence, the old disappear. But principles are permanent. The lessons of history have been but repeated. As always on the sea, forces must be mobile, rapid, active, enterprising. The fleet should never get underway without a well considered plan. Once underway, it must take the initiative, use every possible resource to fulfill the details of that plan. The World War once more demonstrated the value of the following principles; the principle of assuming the offensive, the principle of initiating operations, the principle of secrecy, the necessity for obtaining accurate information.

Permanent also are the following; the control of the surface of the sea is always the essential requirement; only within reasonable limits does there exist so-called "freedom of the sea." To be successful, not only must all arms of a nation be co-ordinated, but also all its resources, economic, political and financial. It is an illusory and insidious policy to rely upon *guerre de course* exclusively, no matter how great the discrepancy in sea power.

In conclusion Commander Castex discusses the four fallacies in connection with submarine warfare that have been demonstrated.

First, the submarine will finally become the principal instrument of naval warfare. Second, the submarine will replace all other types of naval vessels.

The submarine is very far from being supreme in naval warfare. Far from superseding other types, it merely rounds them out, without in the slightest degree replacing any of them. Only in conjunction with other arms does it attain its full value; it needs their support. Above all, it needs the assistance of the great guns of the surface units.

The third fallacy, though of a contrary nature to the first and second, is: the submarine will be above all else, a defensive weapon.

The submarine is not a weapon of defense. On the contrary it is an offensive weapon of primary importance. Originally intended to protect home waters, it has made offensive incursions to the Azores, to Liberia, to the United States. Its rôle has been clearly demonstrated to be an offensive one.

The fourth fallacy: the submarine by its irresistibility will paralyze naval forces. This is not true provided the large vessels are constructed to cope with the exigencies of the new situation and to meet the torpedo menace.

Finally, to accomplish the object sought after, namely unequivocal victory, the union of arms must govern. The guns and the torpedoes of capital ships, cruisers, destroyers and submarines must be employed in entire unison, each according to its individual rôle, and to the utmost extent of their combined abilities.

N. R. V. DER V.

SECRETARY'S NOTES

Membership

Present Membership, 4646. Changes since January 1, 1923: New Members, 197. Resignations, 74. Deaths, 20. Total Increase, 103.

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